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ABSTRACT

The second of four volumes, this report documents the implementation, evaluation, and institutionalization of the Alaska Administrative Communications Network, an electronic mail system (EMS) developed by the Educational Telecommunications for Alaska Project in response to the need for faster, more efficient communication in support of the administration of schools throughout the state. Following a review of the context of educational needs in Alaska, the purpose and results of the Alaska State Department of Education's Planning and Evaluation Survey and Telecommunications Alternatives Survey are discussed. The development of the Administrative Communications Network is then recounted, including its objectives, the expected results of the project, the evaluation and organization of the network, the design for evaluating the system, initial tests of the EMS, EMS components, development of an operational framework for EMS, training EMS users, pilot testing of EMS, and steps toward its institutionalization. Technical features of the system, usage levels, cost effectiveness, and user satisfaction are also considered. Among the appendices are a list of key events in the development of EMS, a description of EMS software, a statement of EMS conditions for use, and a copy of the EMS use survey. (JL)

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EDUCATIONAL TELECOMMUNICATIONS FOR ALASKA

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VOLUME II

ADMINISTRATIVE COMMUNICATIONS NETWORK

Prepared for:

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The foundation of every state is
the education of its youth.

Dionysius

FOREWORD

It was with considerable excitement and some trepidation that the Department of Education undertook the Educational Telecommunications for Alaska Project in 1977. The Project was viewed with excitement since technology appeared to offer great potential for solving some very difficult problems facing public education in the State. It was viewed with some anxiety because the solutions posed involved complicated and relatively untried technologies which presented educators with strategies that were in part unfamiliar and mysterious.

No other state education agencies were investing such a large amount of funding in what some regarded as a very risky venture in modern technology. However, the State took the position that the Project offered possible solutions to educational problems where no alternative solutions were known to exist. It was regarded as a capital investment that could pay large dividends for years to come. The systems developed by the Project were to be thoroughly evaluated. Only those that were judged to be successful and to hold long-term potential for improving education in the State were to be maintained beyond the term of the Project.

In retrospect it is interesting that there was such a high degree of caution at the onset of the Project. The systems developed by the Project are now an integral part of the educational delivery system in the State. They are used by a wide variety of educators -- State and local administrators, teachers, local support staffs, and, most importantly, students in many, many communities.

The Project was designed to address three basic needs. These were as follows:

- The need for faster, more efficient communication in support of the administration of schools in the State.
- The need for quick access to information about educational resources.
- The need for instructional support for rural high school students.

Three systems were designed to address these needs:

- An administrative communication network (electronic mail system) that interconnects the Department of Education with the 52 local school districts and other educational agencies in the State.
- A computerized "Alaska Knowledge Base" containing information about a variety of educational resources and accessible via the electronic mail system.
- A microcomputer-based method for providing instruction to rural high school students and a set of core courses for ninth and tenth graders.

Today much of the time-critical written communication associated with the statewide-administration and support of local school districts is transmitted via the Administrative Communications Network. Teachers and administrators regularly consult the Alaska Knowledge Base to locate educational resources to apply to problems they encounter. Virtually all school districts in the State utilize microcomputers for a portion of their instructional program and students in small rural high schools have available to them a variety of high school courses because of the project.

The Project has had a major impact on the nature of education in the State. In fact, largely through the impetus provided by the Educational Telecommunications for Alaska Project, Alaska is regarded as a leading state in the application of educational technology. The Department is very pleased to have received the support provided by the National Institute of Education and the State of Alaska. We anticipate continued work in educational technology in the years to come.

Successful institutionalization of the Educational Telecommunications for Alaska Project is documented in a set of four final reports: one covering each of the three educational systems and an Executive Summary. This volume contains one of those reports.

In fulfillment of its commitment to the National Institute of Education, this set of documents is submitted in the sincere hope that the reports will also provide insights and information useful to others in their efforts to improve the quality of public education in the future.

MARSHALL LIND
Commissioner
Alaska Department of Education

ACKNOWLEDGEMENTS

The Educational Telecommunications for Alaska (ETA) Project has affected a number of significant changes in educational administration and instruction in Alaska. These changes represent improvements in the quality of public education in the State. The Project involved highly complex applications of modern technology to identified educational needs. However, the complexity of coordinating the efforts of many individuals and groups was by far the most difficult problem addressed by the Project. The success of this Project was due, therefore, to the contributions and willingness to cooperate on the part of a large number of persons.

Throughout the term of the Project the support of the State Board of Education, the Governor's Office, the Alaska Legislature, and the National Institute of Education has been paramount. Without this support and the endorsement of the Commissioner of Education, Marshall Lind, the Project would not have been possible.

The design of the Project was developed in 1976-1977 by a team of individuals led by Ernest Polley, then Coordinator of Planning and Research for the Department of Education. Polley's continued support during the term of this Project was essential.

The Educational Telecommunications for Alaska Project was managed by a core staff of Alaska Department of Education personnel. The staff were located first in the office of Planning and Research and later in a new Office of Educational Technology and Telecommunications which came into being largely as an outcome of the Project. The ETA Project director in DOE was William Bramble who in July, 1981, became director of the Office of Educational Technology and Telecommunications. Ed Obie served as assistant Project director until July, 1981, when he was appointed Project director for the remainder of the Project term. Professional staff at DOE assigned to the ETA Project included Paul Berg, Rosemary Hagevig, and Bee Tindell. Other individuals in DOE who contributed to the overall success of various components of the Project included Alexander Hazelton, Eula Ruby, Sandra Berry, and Dan Boone.

Assistance in the development of the Project design was provided by the Northwest Regional Educational Laboratory (NWREL). Upon approval of the initial grant award from NIE in September, 1977, and, with the commitment of NIE and the Alaska Legislature to support the multi-year effort, NWREL became the Design and Implementation Contractor for the Project. NWREL designed, developed, and pilot-tested the major technological systems included in the Project. In addition, NWREL produced the computer-based courseware for rural high schools. The overall NWREL effort was administered by Tom Olson and, later, Ethel Simon-McWilliams. NWREL staff who contributed to basic systems design and development included Judy Edwards, Hal Wilson, Stuart Brown, and Ralph Van Dusseldorp. Ann Murphy, Kathy Busick, Craig Copley and many others from NWREL contributed to the development of computer-based courseware.

Key support for the installation of the data communications network was provided by two other State agencies. The Division of Data Processing, Department of Administration, provided for the procurement, installation, and operation of data processing elements required for the Electronic Mail System and educational data bases developed by the Project. The contributions of David Riccio and Stan Hamlin were critical in this regard. The data

communications network established for this system was implemented by the Division of Communications, Department of Transportation and Public Facilities, with considerable input from Walt Pierce of that agency.

Two intermediate education agencies performed important functions related to pilot testing and implementing the systems developed by the Project. These were the South East Regional Resource Center in Juneau and the South Central Regional Resource Center in Anchorage. The contributions of Alan Barnes, Luanne Packer, Linnel McCrumb, and Jane Harrington were especially noteworthy.

Other individuals or agencies contracting to DOE or related State agencies made substantial contributions to the success of the Project. Transalaska Data Systems installed and maintained microcomputers at sixty locations in the State. Karen Parr developed instructional materials and provided training for the computer-based education courses developed by the Project. Glenn Cowan and Janelle Cowan contributed additional training and support for these courses. Computer programming support was provided to the Department by Mike Noel and Charles Dockery. The evaluation of the computer-based instruction courses was conducted by Education Skills Development of Lexington, Kentucky, with contributions from Emanuel Mason, Timothy Smith, and Frank Gohs.

Extremely important to the success of the systems and the particular products developed by the Project were the many contributions of administrators, teachers, and other staff of local school districts in Alaska. These individuals served to keep the Project on track in design and development through participation on numerous design and advisory teams that existed during all phases of the Project. Additional individuals too numerous to include assisted with pilot testing and implementation of the Project components. By the conclusion of the Project every one of the 52 school districts in Alaska had participated. Noteworthy too was the involvement of several hundred students in Alaska schools who participated in pilot tests of instructional materials. Students in public schools, of course, are the ultimate beneficiaries of the Project. It is fitting, therefore, that the participation of these students should result in educational gains for all the children of Alaska for years to come.

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PREFACE

The Educational Telecommunications for Alaska Project addresses the needs of three distinct user groups: superintendents/administrators, school staffs, and students. As such, there are three tracks that at times coincide but, in the main, follow their own evolutionary course. Thus, each of the components, Administrative Communications Network, Alaska Knowledge Base System, and Individualized Study by Telecommunications, has been developed as a stand-alone volume for those who are particularly interested in one but perhaps not the other components. The Executive Summary ties the entire Project together by providing an overview of all components.

Included in each volume is a historical perspective detailing Alaska's prior experience with satellite technology and the Alaskan educational and geographic contexts – all of which shaped the Project as it was proposed to the National Institute of Education in 1977. Without this perspective, a great deal of understanding of the driving forces involved would be lost. Thus, the reader will find that several introductory sections are repeated in each volume.

HISTORY OF ALASKAN INVOLVEMENT WITH SATELLITE COMMUNICATIONS

The Educational Telecommunications for Alaska (ETA) Project is the result of years of planning and experimentation with communication satellites by the State of Alaska. The first cautious probings were conducted with the National Aeronautics and Space Administration's (NASA) Advanced Technology Satellites, ATS-1 and -6, beginning in 1970 and continuing through 1975. The experiments included both voice and full-motion video for education, in support of health care, and for reaching out to all people with a need for information that affected their lives. Experimentation with the new technology was driven by the necessity to provide a large variety of services to all Alaskans, whether they lived in cities or in the most isolated areas. These tentative explorations demonstrated to the State that communication satellites were an essential element in meeting future needs for education and other public services.

The process began in 1968 with the establishment of a Satellite Task Force whose objective was to determine the total requirements for all communication services existing and projected.

In late 1969, a formal proposal was submitted to NASA for two-way audio experimentation on the ATS-1 satellite. The first demonstrations began in 1970, transmitting public radio programming between KUAC in Fairbanks and stations in the lower 48 states.

A joint United Nations Educational, Scientific and Cultural Organization (UNESCO) - Alaska National Education Association (NEA) team in 1970 investigated the feasibility of using satellites to alleviate educational problems of the State. The team concluded, in part, "Satellite communications for Alaska, as part of an overall long-range educational communications system, are not only feasible, but necessary for improved communications in the State."

In mid-1971 an Alaska Educational Telecommunications Consortium (AETC) was created to guide ATS-1 projects (two-way voice) and to identify technical solutions to help solve rural educational problems. Over the succeeding two years, more than 25 villages with no existing telephone or television service were involved in the interactive project. Programming was varied, ranging from health-aide training to Native legends; teacher, administrator, and classroom exchanges; and direct village contact with library services. As with many innovative approaches, this project was initially plagued with many problems involving technical factors and frequent schedule changes. The weakest link, however, was the lack of direct teacher involvement in designing programs for classroom use. The most successful applications were in villages where someone, usually a teacher, took responsibility for involving the community. The study concluded that experiments should continue with more emphasis on evaluation of impact between participating schools and non-satellite schools.

Educational experimentation became very infrequent but continued through 1975. Emphasis during this period shifted to detailed studies of educational needs. The Teleconsult study, submitted to the Department of Health, Education and Welfare (DHEW) and NASA, included exploration of persistent educational needs, suggestions of specific programming areas, and establishment of priorities to meet those needs. The focus remained on audio and visual materials distributed via a variety of means, including commercial satellites. Priority programming areas included Native culture, bilingual news programs, and on-going teacher in-service training.

In 1972, the Alaska Educational Broadcasting Commission (AEBC) submitted to the U.S. DHEW "A Proposal to Develop a Plan for Alaska's Unique and Innovative Education Demonstration Employing ATS-F." (The letter designator is assigned to NASA experimental satellites prior to launch; in orbit the satellite became ATS-6.) This satellite, the most powerful ever to be launched at that time, could relay video as well as audio to small, inexpensive earth stations. The proposal was subsequently funded.

While attention focused on satellite-supported educational needs experimentation, an Executive Order created the Office of Telecommunications (OT) within the Governor's Office in 1973. OT was to provide the State with a focal point for communications policy development and to ensure adequate development of cost-effective communications techniques to serve all State residents. In March of that year, OT assumed responsibility for Alaska's ATS-F Demonstration Plan. In August, 1973, Federal supervision of the national educational ATS-F demonstration program, the Education Satellite Communication Demonstration (ESCD), became the responsibility of the National Institute of Education (NIE). Planning objectives for the Alaskan educational portion of the ATS-F demonstration were:

- to gain operational experience with communication satellites;
- to apply the experience gained on ATS-1 and to extend that experience so that the users themselves would generate service requirements. (It was felt that it was better to obtain knowledge through experience before planning was completed rather than after a system was installed.)

From the earliest planning stage. close cooperation between OT and the Alaska Department of Education (DOE) resulted in project focus on two instructional concerns: first, the desire to establish two-way communications between participating educators that approximated face-to-face communications as closely as possible; and, second, the opportunity for "hands-on" experience with live video/audio communication, by a variety of users, to be utilized to make sound planning decisions.

In 1974, with a portion of the funding received from NIE, 15 communities whose average population was less than 250, were equipped with small satellite earth stations. Consumer committees were formed from persons nominated by the participating villages and Native regional corporations. They met regularly and were responsible for input to and approval of all program designs. Programs in health education and language development were designed and produced. Each program included teacher manuals and was followed on-air with an interaction session as well as on-camera teachers to reinforce the lessons. Teacher in-service training, coordinated and developed by DOE, was broadcast weekly.

Other aspects of the $1.7 million project resulted in 100 hours of television programming being designed, produced, and broadcast. Instructional programs were made available to 1,200 K-5th Grade rural school children and 150 rural educators. Additional programming was accessible to 9,000 Alaskan village residents, young and old, as well as thousands of students in Fairbanks. At the end of one year the Demonstration came to an end. ATS-6 was moved in its orbit out of sight of Alaskan earth stations and toward India for their use. However, the results of the NIE-sponsored evaluation of ESCD had a strong influence on the direction that the ETA Project would eventually take. Key recommendations were:

- Undertake telecommunications demonstrations in rural Alaska only when there are resources and commitment for putting aspects of the demonstrations which users deem successful directly into operation.

- Undertake satellite television operations only when they can be justified on the basis of cost-effective, timely access to programming.
- Use audio interaction without video programming as soon as there is satellite telephone.
- Decide separately commitment to broadcast material and commitment of resources to new programming. The commitment to new programming must be preceded by a survey of available programming.
- Take solution to the "high school problem" as the mandate for telecommunications in rural Alaska. Three alternatives for augmenting the village high school curriculum are: materials distribution of already existing programming; teacher-sharing via audio presentations and supervised interaction; and new programming on Alaska Native history.

The momentum generated by the ATS-6 experiments convinced Alaska educators and OT to make an in-depth assessment of an operational communications-supported system to meet the identified needs of Alaskan education. The result was a planning grant application submitted to NIE in March, 1975, the goal of which was a cost effective model for technological application integrated with educational needs. The grant was received from NIE in November, 1975. It was at this juncture that the Alaska DOE accepted lead responsibility for the planning grant and future activities growing out of it.

Concurrently, commercial satellite technology was emerging as a viable means for meeting Alaska's telecommunications needs. In 1975, the State and RCA Alascom (the Alaska communications carrier) reworked RCA's original plan for facilities and services to serve Alaska through 1980. The State Legislature appropriated $5 million to procure 100 small (15-foot) earth stations for rural communities and, in July of that year, it was agreed that Alascom would install and operate them. In early 1976, RCA launched its second satellite (F-2) which would carry Alaska's long-distance intra- and interstate traffic.

By early 1976, therefore, an excellent base had been established from which to launch an earnest assault on the problems that had continually plagued rural Alaskan educators: the DOE had practical experience with the techniques associated with telecommunications-supported education; OT had hands-on experience with satellite telecommunications hardware and operations; rural Alaskan villages had participated in "learning at a distance" and were supportive of further experimentation; and RCA Alascom was beginning to install rural earth stations subsequent to the launching of F-2.

In 1976, decentralization of rural education through disbanding the Alaska State-Operated School System (ASOSS) gave a sense of urgency to DOE's plans to implement innovative and cost-effective means for educating all Alaskan children. Dissolution of ASOSS resulted in the creation of 21 new rural school districts with elected local school boards and community advisory committees. Supervisory fragmentation, so long a fact of educational life in Alaska, was ending, and DOE became the key administrative and technical assistance office to support the State's 52 separate school districts.

In May, 1976, the sense of urgency was further heightened when the State Board of Education adopted new regulations that stated that school districts must provide an elementary school in each community which had eight or more children available to attend, and, unless the local school committee requested otherwise, must establish a secondary school in every community with one or more available secondary students. The implications of this ruling were staggering – the DOE was required to provide a full and meaningful educational experience for students where they lived. To do so by conventional means could not be economically supported, even if there were a sufficient number of qualified teachers. It was imperative that new and innovative mechanisms be explored to provide quality education to rural Alaska.

A DOE-led task force began preparation of a proposal in July, 1976, to be submitted to NIE. It was made possible by an $85,000 grant from the Alaska Legislature. The essential outcome of the proposed effort was to be an operational, user-supported system. The intensive planning effort by the DOE task force was to develop two major documents: (1) a determination of needs, and (2) an analysis of technical alternatives to meet the specifically defined needs.

The participants included:

- *DOE* – responsible for management and development of the overall proposal and determination of needs;
- *DESIGN TEAM* – a working group responsible for providing design parameters, direction, and pertinent information to the design subcontractor;
- *USER'S GROUP* – a representative group of Alaskan educators responsible for reacting to the proposal as it was developed and for paying particular attention to consumer control mechanisms;
- *PROPOSAL DEVELOPMENT CONTRACTOR (NORTHWEST REGIONAL EDUCATIONAL LABORATORY)* – responsible for producing the required drafts of the proposal.

Based on this intensive effort, the proposal that initiated this Project, entitled, "Educational Telecommunications for Alaska," was prepared and submitted to NIE in January, 1977.

THE CONTEXT OF EDUCATIONAL NEEDS

The Educational Telecommunications for Alaska (ETA) model has been shaped by identified needs. The needs themselves were the results of the Alaskan environment and the philosophy of the Alaska Department of Education. An understanding of the background and context in which the Project functions is essential to understanding the value of ETA itself. The following narrative has been adapted from two DOE documents: "Educational Telecommunications for Alaska Project Proposal," January, 1977; and "Operational Plan Educational Telecommunications for Alaska Project," 1979.

DEMOGRAPHIC CONTEXT

Alaska is the largest state yet contains the smallest total population. More than 280 communities are widely scattered over 586,412 square miles (16 percent of the total area of the United States). The population in 1977 was estimated to be 411,211 (less than 0.5 percent of that of the United States).

Population density statewide is less than one person per square mile with 60 percent of the inhabitants living in or near three cities (Anchorage, Fairbanks, and Juneau) that are in boroughs that contain 2 percent of the State's total land. An adjusted density ratio indicates that outside these three urban areas, the density approaches one person per four square miles.

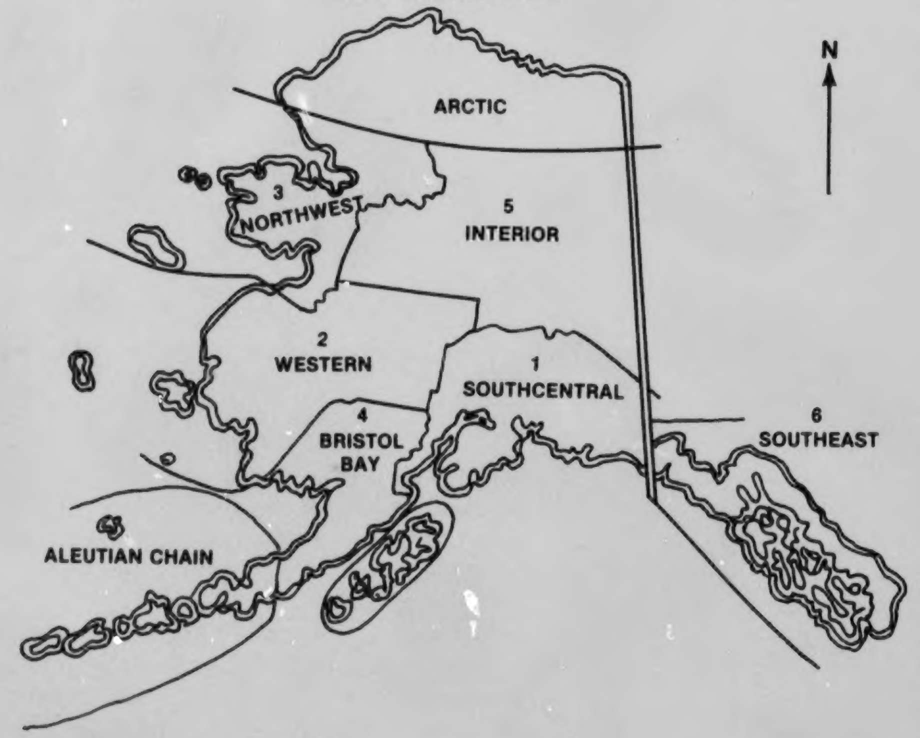
The State is regionally divided as shown in Figure 1. The most populated region is Southcentral, which includes the largest community, Anchorage. Forty-four percent of all Alaskans live within the Anchorage Borough. The Interior region ranks second with 21 percent. The population of this region is reduced to only 7 percent of the State's total when the second largest city, Fairbanks, is excluded. The Aleutian Chain and Kodiak together contain 5 percent of the population. One-third of all Southeasterners live in the State's third largest city, Juneau, the capital. The remainder of the State's people live in 150 communities (ranging in number from fewer than 25 to more than 5,000) distributed throughout the Southeast, Western coastal and Interior areas, and Arctic North.

About one-sixth of the inhabitants are Eskimo, Indian, or Aleut. The major cultural groups are Inupiat Eskimo in the Arctic and Northwest; Yupik Eskimo in the Western and Bristol Bay region; Aleuts in the Aleutian Chain and Kodiak; Athapascan Indians in the Interior; and

Tlingit, Haida, and Tsimshian Indians in the Southeast. Alaska has six major languages other than English, with more than 50 significantly different dialects.

Figure 1

ALASKAN REGIONS



The total population has grown more than 34 percent since the census count in 1970, due mainly to heavy migration related to pipeline and construction-industry activity. Since total school enrollment during the 1975-76 period increased only 18.5 percent over the 1969-70 period, it is concluded that the population growth due to pipeline activity has not impacted on the vast majority of the schools in the State.

GEOGRAPHIC CONTEXT

Forty percent of all Alaskans, and 60 percent of all schools, are located in communities of fewer than 1,000 people. Isolation is often a fact of life, frequently by choice. The major factors contributing to isolation are geography, weather, the distances between communities—factors that create consistent problems in providing educational services and support.

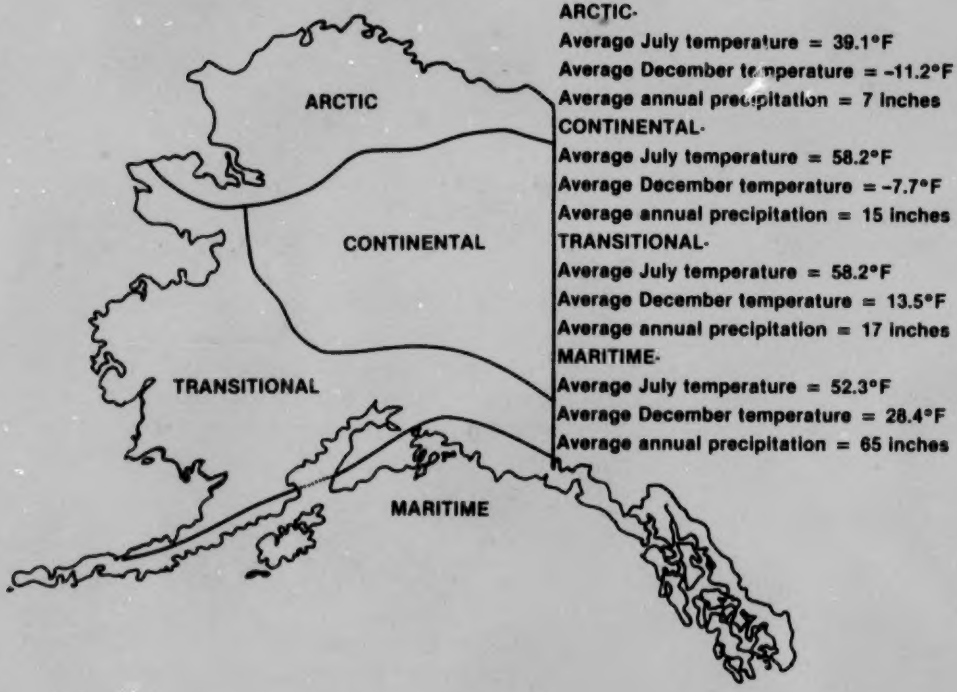
Alaska's terrain can be visually dazzling while posing formidable barriers. The fjords of Southeast and the Alaska range in Southcentral are continuations of the coastal ranges in the northwest United States. The broad valleys and basins of the Interior are an extension of the desert plains between the Rockies and coastal mountains. The Rockies extend into the Brooks Range in northern Alaska. The Arctic coastal plain north of the Brooks is flat tundra with thousands of shallow lakes.

The State's mountains contain half the world's glaciers, with 19 peaks of more than 14,000 feet. One-third of the State is north of the Arctic Circle. Throughout Alaska there are more than three million lakes larger than 20 acres, and 10 rivers more than 300 miles long.

The climates imposed by this topography create a diversity of environments (Figure 2). Fierce, long winters have nights 24 hours long. The 2,000-mile Aleutian Chain is wet, foggy, cold, and frequently windy, year-round. Temperatures in the Interior region vary drastically from winter to summer (-50°F. to +90°F.). The most temperate region is Southeast, where the warming Japanese Current meets cool mountain air and results in more than 100 inches of precipitation a year in some areas.

Figure 2

CLIMATE ZONES IN ALASKA

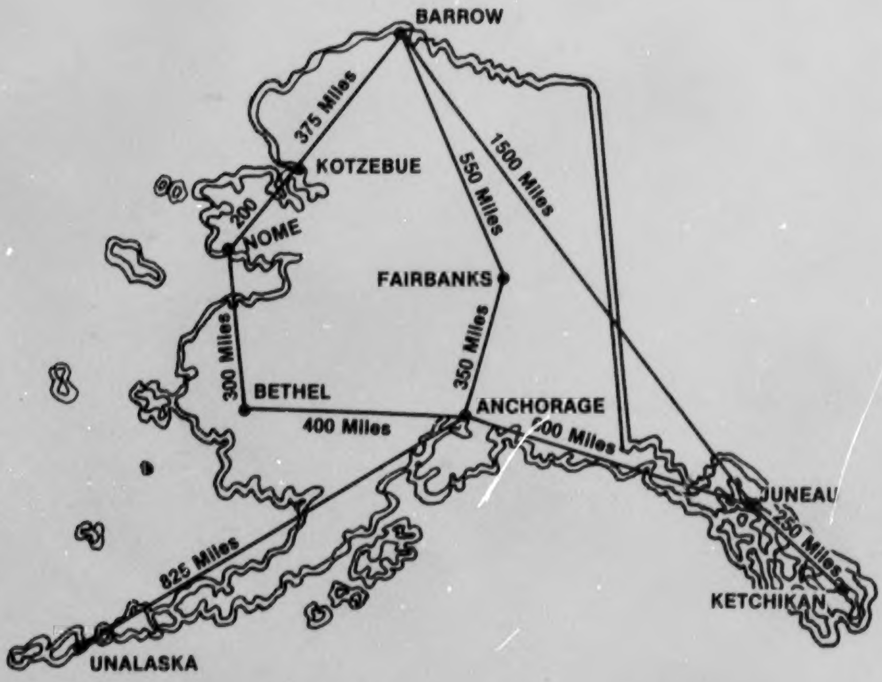


ARCTIC-
Average July temperature = 39.1°F
Average December temperature = -11.2°F
Average annual precipitation = 7 inches
CONTINENTAL-
Average July temperature = 58.2°F
Average December temperature = -7.7°F
Average annual precipitation = 15 inches
TRANSITIONAL-
Average July temperature = 58.2°F
Average December temperature = 13.5°F
Average annual precipitation = 17 inches
MARITIME-
Average July temperature = 52.3°F
Average December temperature = 28.4°F
Average annual precipitation = 65 inches

Distances in Alaska are vast (Figure 3). From its west to east coasts, Alaska stretches the distance from California to Florida. The northernmost community, Point Barrow, is 1,500 miles from the southernmost city, Ketchikan; Point Barrow is as far from Fairbanks as Milwaukee is from Kansas City; Bethel is 400 miles west of Anchorage – approximately the same distance as San Francisco is from Los Angeles. These great distances contribute substantially to a sense of isolation and remoteness. The extremes of winter weather limit activity and contribute to Alaska's high alcoholism rate and in other ways adversely impact daily life.

Figure 3

DISTANCES BETWEEN SELECT CITIES


BARROW
375 Miles
KOTZEBUE
550 Miles
1500 Miles
200
NOME
FAIRBANKS
300 Miles
350 Miles
BETHEL
ANCHORAGE
400 Miles
600 Miles
JUNEAU
250 Miles
KETCHIKAN
825 Miles
UNALASKA

The effects of this isolation can be felt by Alaska's rural teachers, many of whom are not indigenous to the State. One teachers' group in a small, rural district negotiates into all contracts a yearly trip to Anchorage for an annual teachers' conference, and considers the expense a worthwhile investment in mental health and needed professional contacts not available in the village.

ECONOMIC CONTEXT

The environment and the variables in resources and industry make employment highly seasonal. Many industries – construction, fishing, logging – are not active in winter, when the weather makes outdoor work and travel difficult, if not impossible. Depending on the time of the year, region, and industry, unemployment rates fluctuate by a factor of three. State and Federal unemployment insurance payments for December through March may be double, even triple, the claims paid in June through August.

Many isolated, rural areas with rather depressed incomes still rely to some extent on subsistence hunting and fishing. While health, education, and other services are more readily available in large Native villages, subsistence hunters must compete for fewer available resources. The situation is succinctly described by the following passages from "2(c) Report: Federal Programs and Alaska Natives."

> "...In recent years it has become apparent that all rural Alaska villages are in an economic trap because of the transition from subsistence to cash. They are unable to return to a complete subsistence life, nor are they able to earn enough cash to buy food, supplies, and services required to live comfortably in the larger communities.
>
> "Despite this, subsistence hunting, fishing, and gathering still play a critical part in the lives of rural villagers. Of roughly 150 Native villages of less than 300 people, subsistence activity is estimated to provide at least half of the daily calorie intake.
>
> "Temporary, seasonal employment may be available to provide some income, but also takes men away from the villages at times when subsistence foods can be most easily obtained. The available cash usually goes for materials and equipment that are vital necessities today in subsistence activities: rifles and ammunition, snow machines and outboard engines, and gasoline.
>
> "As subsistence life becomes more expensive and difficult, people must increasingly depend on store-bought groceries and goods. Young people returning to the village from boarding schools who have not learned the subsistence skills must live more and more in the cash economy."

The establishment of schools in some areas of the State has been a major contributor to the growth of larger, stable, primarily Native communities. The highly nomadic Eskimos in the Brooks Range established the permanent village of Anaktuvuk Pass because of the requirement that children attend school nine months of the year. The establishment of more permanent residences has generated the need for services suited to community living. As a result, electrical power became a necessity for residents. Virtually all schools in the State have electricity, supplied either by local utilities, school or Federally-owned generators, or the Alaskan Village Electric Co-op (AVEC). In some villages, the construction of a one- or two-room school was accompanied by the introduction of the first generator.

TRANSPORTATION CONTEXT

Power, fuel, and other goods and services are very costly because of the limited market and because of transportation costs. Whether by road, water, rail, or air, the cost of travel and freight delivery is high.

In 1970, Alaska had 7,000 miles of road, only 3,000 of which were paved. There has been no significant increase in roads since. It is interesting to compare access in Alaska with several other sparsely populated Western states:

State	**Acres of Land Per Mile of Road**
Alaska	52,212
Arizona	2,203
Montana	1,295
Wyoming	891

Alaska may well have more communities and schools that are not on any road system than the rest of the States combined. More than 150 rural schools are not on any connecting road system at all. The primary road network links Anchorage, Fairbanks, and Haines with connections to the Kenai Peninsula, Valdez, and many of the smaller communities in-between. But even this land link is lost for many villages in the winter when many arterial roads are not maintained and are therefore impassable.

Alaska's railroad network is even more limited. The 540-mile Alaska Railroad links Whittier, Anchorage, and Fairbanks, running daily in the summer and twice weekly in the winter. In southeast Alaska, a 110-mile narrow-gauge railroad runs from Skagway to Whitehorse in Canada's Yukon Territory.

Goods are delivered to Southeast, Southcentral, and the Interior by a combination of sea, truck, and rail. Commercial freighters and barges travel regularly between the lower 48 states, Anchorage, and some larger coastal communities. State-operated ferries carry passengers and freight among principal communities in Southeast and among communities on Prince Williams Sound, Cook Inlet, and Kodiak Island. Occasional service is provided to villages on the larger rivers by commercial freight boats. Usually an entire winter's supply of goods, ordered six months previously, is delivered in the fall.

Travel by air in Alaska is disproportionately heavy; in many areas there is no other means of transportation. Alaska ranks first in the nation in number of private pilots and planes, and in passengers and cargo tonnage flown annually. Anchorage and Fairbanks are served by several international carriers; five carriers serve most regions of the State on a regularly scheduled basis. There are numerous smaller lines, flying to virtually every village on schedule (weather permitting) or by charter. Freight to "bush" villages (meaning, generally, those inaccessible by road) is commonly delivered by small twin-engine planes in the winter, but the costs are very high.

NIKOLAI
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·AIRPORT·

Air travel, although the most widely used means of transportation, can be very expensive as well as time-consuming. For example, the 1,500-mile trip from Ketchikan to Point Barrow requires four stops, two changes of airlines, and takes nine hours. A comparable 1,500 journey between Boston and Miami is non-stop and takes less than three hours.

The difficulties and costs of travel plague Alaskan educators continually. For instance, Atka's representative on the regional school district board was chosen to represent the board at a statewide conference to be held in Juneau in June, 1976. The school board member left on a tug for the 100-mile, six-hour trip to Adak, then chartered an eight-seat, twin-engine aircraft for the 600-mile flight from Adak to Cold Bay. From Cold Bay, she then flew to Anchorage by commercial prop-jet, spent the night in Anchorage, and made connections with a commercial jet flight to Juneau the following morning. The 1,760-mile trip to Juneau took approximately 30 hours and cost $2,600, one-way (1976 dollars)!

COMMUNICATIONS CONTEXT

The geographic barriers, environment, and vast distances that contribute to isolation and the high cost of goods and transportation, have also contributed to Alaska's lack of extensive communications networks, especially in rural areas.

MAIL SERVICE

Virtually every community with a stable, year-round population (and every community with a school) has a post office and mail service. In smaller communities, deliveries may be only weekly or even monthly, almost always by small plane and barge.

Mail service has been the most relied upon means of statewide communication among educators. But weather is a major cause of unreliable bush service; if the river is freezing, or a storm hits, the mail plane cannot land. It has not been uncommon for a rural administrator or teacher to receive a request for information or notice of a meeting requesting a response, with the response due two days before the notice was received and three weeks after the notice was mailed.

TELEPHONE

In 1971, RCA purchased the Department of Defense-operated Alaska Communicatons System (ACS) consisting of terrestrial links in the Interior and Southcentral regions. A subsidiary corporation, RCA Alascom, was then established as Alaska's commercial long-lines carrier. RCA Alascom also began leasing portions of the U.S. Air Force-operated White Alice Communications System (WACS), using the combination of microwave troposcatter, landline, and marine cable links to provide long-line communication to some areas of the State not otherwise served. In 1973, RCA Alascom provided the first interim satellite links with landlines and microwave circuits through leased channels on the Canadian satellite Anik II, with a transfer to Western Union's Westar II two years later.

COMMERCIAL AND PUBLIC RADIO AND TELEVISION

An estimated 95 percent of all Alaskans can receive at least one radio broadcasting station. Nearly a dozen radio stations are publicly owned, operating under the auspices of the Alaska Public Broadcasting Commission (APBC) within the DOE. In 1978, a private non-profit corporation was established to interconnect all existing public stations in sharing local and national programming, legislative news, and other public affairs programming.

Some type of television service is also available to approximately 95 percent of the State's population. There are seven commercial television broadcast stations serving Anchorage, Fairbanks, Juneau, and Sitka and providing direct or translator reception to approximately 60 other communities. The State has leased a full transponder on RCA's F-II satellite to meet commercial broadcasting needs in Alaska. Satellite transmissions originating in Pennsylvania and California are received in Anchorage and Juneau for real-time broadcasting or for taping and delayed broadcast. Real-time broadcasting needs in other

Alaskan cities are met through a terrestrial translator system connected to Anchorage or Juneau. The APBC receiving earth station in Anchorage tapes the interstate satellite transmissions, and rebroadcasts to non-commercial stations in the State. APBC then submits a video cassette of its programming to a State-contracted facility which dubs the cassettes and distributes them through the mail to mini-TV stations throughout Alaska.

The DOE, through its Instructional TV (ITV) Project, has used satellite time not used for affiliate and bush entertainment feeds to provide instructional television to a number of village sites. As a result of modifications of select receive-only earth stations through the Satellite Demonstration Project, sponsored by the Governor's Office of Telecommunications, instructional television has become available to a larger number of communities. This is accomplished by using a 10-watt broadcast transmitter to serve each community equipped with the earth station. A number of communities have cable television offering programs taped in Seattle and circulated throughout the State in distinct separate distribution loops. Programs are delayed from one to five weeks, and the cost of cable services ranges from $18.00 to $50.00 per month.

EDUCATIONAL CONTEXT

ELEMENTARY AND SECONDARY PUBLIC SCHOOLS

In 1978, 241 Alaskan communities had at least one school. Thirty-five percent of all schools were located within the Southcentral region and served 57 percent of all enrolled students. The Interior region contained 18 percent of all schools and students. Southeast had a substantial number of smaller "urban" communities in addition to scattered rural communities. This region contained 15 percent of the schools and 13.5 percent of the State's students. The remaining regions were primarily rural, with small school enrollments. The Western region contained 4.5 percent of total enrollment and 11 percent of the schools, followed by Northwest with 3 percent of the students and 8 percent of the schools. Bristol Bay had 2 percent of total enrollment, 7 percent of the schools.

Sixty-one percent of all elementary schools and 71 percent of all secondary schools have enrollments of fewer than 100. Of these secondary schools, 46 percent have fewer than 50 students and 36 percent have 10 or fewer.

LIBRARIES

There are approximately 300 public, school, university, and special libraries in Alaska. The State Library, within DOE, coordinates statewide services and assists individuals who lack access to a local library.

Mail service is the usual means of materials distribution and inter-Library communication. The State Library provides direct assistance and/or training to librarians and circulates close to 100,000 items by mail each year to community libraries, schools, other institutions, and individuals.

The Alaska Health Sciences Information Center services requests for information by health sciences personnel statewide. The Center operates from the University of Alaska Library in Anchorage and provides Medline computer searches of the National Library of Medicine holdings.

Material searches are facilitated by an extensive inter-library loan network. Telex and, more recently, the Electronic Mail System (EMS) link major facilities in Juneau (EMS), public libraries in Anchorage (EMS) and Fairbanks, the University of Alaska libraries in both cities, and the Pacific Northwest Bibliographic Center at the University of Washington, Seattle. Service requests from outside these centers are sent to Juneau, Anchorage, or Fairbanks.

The Juneau State Library facility also contains the Educational Resources Information Center (ERIC) microfiche data bank (ED series). Fiche copies are distributed by mail. In addition, the State Library's film centers in Anchorage and Juneau are a major source of 16mm films and video tapes for Alaska's schools and public libraries. In 1978, more than 45,000 films and tapes were circulated from the 16,000 titles held. The State Library also operates a special service for blind and physically handicapped people.

HISTORICAL CONTEXT

DECENTRALIZATION

Isolation between schools and school districts, coupled with the multiple agencies that have historically managed the State's schools, has long precluded the delivery of comprehensive and equitable support to Alaskan schools.

Until June,1975, there were city and borough school districts governed by locally elected boards; schools outside organized city or borough boundaries were operated by the Alaska State-Operated School System; and a number of village schools were operated by the Bureau of Indian Affairs (BIA). Schools in rural, predominantly Eskimo or Indian communities, were divided between ASOSS and BIA according to no geographic or cultural design.

In June, 1975, the Alaska Legislature decentralized the ASOSS and placed governance of rural schools in the hands of regionally elected boards. Twenty-one new Regional Educational Attendance Areas (REAAs) were formed. Boundaries were drawn taking into consideration socio-economic, linguistic, and cultural similarities and natural geographic barriers. While reflecting the strong commitment of the DOE and the State to placing as much control of education in local hands, decentralization increased demands upon the Department to provide adequate technical assistance. The DOE had to assist 52 rather than 31 school districts. Further, with the creation of the new rural school districts there was an increased likelihood of the transfer of BIA schools outside an REAA to the REAA district, thus continuing the move toward a single system of education.

In May, 1976, the State Board of Education took another step toward localizing control of education. It adopted new regulations that required the governing body of the State's school districts to provide an elementary school in each community which had eight or more children available to attend and, unless the community's school committee requested otherwise, to establish a secondary school in every community which had one or more available secondary students. Dramatic changes occurred almost immediately. In 1974-75, when most villages were sending their adolescents to boarding high schools, there were 29 high school programs (not necessarily through 12th Grade) outside incorporated municipalities. In the two fiscal years ending June 30, 1979, 109 villages received funds for construction of high school facilities; nearly all of them were new buildings.

Greater local control and greatly expanded educational opportunities increased the need for DOE support services and statewide resources to address the unique needs of rural students. The DOE initially responded by drawing together all known resources under a project called Systematic Planning Around Needs (SPAN). SPAN gathered and organized information about a variety of human and information resources such as a statewide talent bank of resource persons, national and in-state validated best practices, bibliographical data and abstracts of agencies which offer services to school age populations. These materials were to be requested and then made available via the U.S. Postal Service.

To further meet the resource needs of all districts, the Legislature created six Regional Resource Centers (RRCs) in 1976. These Centers were designed to provide locally chosen means to fill locally identified gaps in essential support services. In addition, the legislation permitted school districts to work jointly to provide cooperative services which would otherwise not be available because of the high cost of establishing all educational services in a single district.

Thus, telecommunications, and its application to education in Alaska, loomed ever more promising as a tool to create management and information channels that would help DOE provide the range and diversity of services demanded by localized control and also to provide quality education to students in rural areas.

ALASKA DEPARTMENT OF EDUCATION

The Alaska Department of Education is charged with the responsibility to:

- exercise general supervision over the public schools of the State except the University of Alaska;
- study the conditions and needs of the public schools of the State and adopt or recommend plans for their improvement; and
- establish, maintain, govern, operate, discontinue, and/or combine area, regional, and special schools.

The executive head of the Department is the State Board of Education, a seven-member body appointed by the Governor and confirmed by the Legislature. One student is selected as an eighth (non-voting) member. The Commissioner is appointed by the Board, subject to approval by the Governor.

The Department's main facilities are in Juneau. Housed there are the executive administration, including the Commissioner, Deputy, and special assistants; Planning and Research Office members who concentrate on research, systems development, and student assessment; and staff members who provide information and distribution assistance for publications prepared for virtually every section of the Department.

Three commissions have been established by State statute, regulation, or Federal law, all with operating programs, staffs, and separate annual budgets. The Alaska Public Broadcast Commission, with staff in Anchorage, regulates public radio and television stations; the Alaska Rural Teachers Training Corps, also supported by staff in Anchorage, administers a post-secondary degree program designed to prepare Native teachers living in rural Alaska who are remote from existing campuses; and the Post-Secondary Commission, with staff in Juneau and Anchorage, reviews all post-secondary institutions, program offerings, and budgets, making funding and legislative recommendations. This Commission also administers the student scholarship financial aid program.

In addition to these Commissions, the Alaska Department of Education functions through five major divisions. Each of these contains a number of sub-groupings and programs: (1) Management, Law and Finance Division; (2) The Division of Education Program Support; (3) the Division of Vocational Rehabilitation; (4) The State Library, its branch units and State Museum; and (5) the recently created (July 1, 1981) Division of Educational Design and Implementation.

EDUCATIONAL NEEDS ASSESSMENT

The components and content of the ETA Project were selected and designed to be responsive to a number of the educational needs as identified by the "Department of Education Plannning and Evaluation Survey" (Spring, 1976). The basic implementation approach was consistent with the findings of the "Telecommunicatons Alternatives Survey" also conducted in 1976 and subsequent to the Planning and Evaluation Survey.

DEPARTMENT OF EDUCATION PLANNING AND EVALUATION SURVEY

This Survey consisted of 69 Linkert items and two open-ended queries on a questionnaire distributed to more than 2,000 Alaskan educators. Respondents were asked to rate the importance of specific areas within four categories of concern: What services should the DOE provide? How should the DOE provide services? What problems have you had in working with the DOE? What areas should the DOE support? A total of 36 percent of the mailed questionnaires were returned; the majority, about 77 percent, were from teachers and the remainder from principals and principal-teachers and specialists. Although the respondents were dominantly teachers, the conclusions were generally supported by educators in the other categories surveyed. The study concluded that the DOE should:

- provide leadership in establishing and maintaining statewide goals, needs, and priorities;
- identify and disseminate educational information, media resources, and Promising Practices;
- examine and improve certification procedures;
- provide in-service training, especially through regional sessions;
- investigate alternate means of funding schools;
- improve communications (with local schools, both formal and informal);
- maintain support and emphasis on the basic skills areas, especially reading;
- develop new programs and curricula and disseminate information about them (especially programs in careers, thinking skills, and special education for the gifted).

SURVEY VALIDITY

The percentage of total returns in each geographical area closely approximated the percentage of the total population of educators in those areas, except for the relatively small response from the Interior:

Area	**Percent**
Southcentral	61.0
Western	8.0
Northwest	4.4
Bristol Bay	3.4
Interior	3.0
Southeast	19.0
Aleutian Chain	1.0

The percentage of total returns from each of the four districts approximated the percentage of the total population of the educators in those districts:

District	**Percent**
Anchorage	30.6
1,000-9,000 persons	39.0
400-999 persons	11.3
1-399 persons	19.1

The percentage of total returns from each of the four occupational groups closely approximated the percentage of the total population of educators in these groups:

Occupational Group	**Percent**
Superintendents	4.7
Principal or Principal-Teachers	14.3
Teachers	77.7
Others	3.4

School superintendents requested that DOE:

- provide program consultation;
- provide management assistance;
- develop a student assessment program;
- provide an assessment of educational statutes;
- sponsor statewide conferences.

Principal or principal-teachers expressed a need for the DOE to:

- conduct in-service training;
- coordinate services through Regional Resource Centers;
- provide knowledge of whom to contact for services;
- develop special programs for educators.

Teachers expressed a need for the DOE to:

- design and conduct in-service training;
- regionalize its services;
- coordinate services through Regional Resource Centers;
- provide program administration guidelines;
- provide a listing of whom to contact for specific purposes in DOE;
- develop special education programs.

Persons classified as "others" (specialists, etc.) encountered problems with:

- calendar deadline conflicts;
- inconsistent responses from DOE staff;
- reaching appropriate DOE personnel;
- lack of knowledge of legislative amendments and new laws.

A copy of the Survey instrument and a detailed analysis of results are included in Appendix A.9, to the report entitled, "Results of Department of Education Planning Survey" in the "Operational Plan: Educational Telecommunications for Alaska Project," Alaska Department of Education, December 1, 1978.

THE TELECOMMUNICATIONS ALTERNATIVES SURVEY

Two basic strategies of data collection were employed:

- A tabloid, "Telecommunications and the Future of Alaskan Education," an associated response sheet, and a video tape were mailed to 6,000 Alaskan educators. The tabloid and video tape explained the telecommunications alternatives available, presented some possible telecommunications solutions to educational problems and asked the educators to rate and comment upon the importance of telecommunications in providing solutions to educational problems they encountered.

- Presentations were made before local boards of education and at a number of meetings of Alaskan educators. The tabloid and response sheet were distributed for later comment while remarks made at the meetings were recorded for immediate analysis.

Because the information content of the distribution material was high, requiring heavy concentration and appreciable time, and since the subject matter was new to many, few responses were anticipated. (The main intent of the mailing was informational.) Seventy-five responses were received, however, and the data culled from these are summarized in Table 1. The percentage of responses is noted in each of the five categories (from high to low priority). The items receiving the highest ratings were those concerning individually initiated instructional resources (as opposed to required), staff development, informal information exchange, increasing input and information on State guidelines, and forms and computerization of reporting methods. These findings were very much in accord with the results of the "DOE Planning and Evaluation Survey."

TABLE 1

COMMUNICATIONS APPLICATIONS (MAIL RESPONSE)
MEAN RESPONSE (%)

	HIGH PRIORITY 5	4	3	2	LOW PRIORITY 1	MEAN
INSTRUCTIONAL RESOURCES						
For Getting Resource Material	37	19	17	17	10	(3.58)
To Expand Courses and Curriculum	39	28	14	7	12	(3.73)
For Getting Research Findings	25	19	32	13	11	(3.31)
STAFF DEVELOPMENT						
For Earning Recertification Credits	24	16	27	10	23	(3.09)
For Keeping Recertification Records	17	6	27	15	35	(2.54)
For Providing Training Opportunities	43	28	13	4	12	3.86)
INFORMATION EXCHANGE						
To Informally Exchange Information and Ideas	21	32	37	0	10	(3.52)
To Improve School Board Communication	17	22	33	17	11	(3.16)
To Distribute Department Information in Media	12.5	12.5	50	25	0	(3.13)
To Increase Public Input to Department	16	42	26	11	5	(3.52)
MANAGEMENT						
To Arrange Meetings on Short Notice	15	16	25	16	26	(2.78)
To Increase Input and Information on State Guidelines and Forms	18	29	27	10	16	(3.22)
To Offer Computerized Reporting Methods	27	16	37	8	12	(3.39)

SELECTION OF TELECOMMUNICATIONS ALTERNATIVES FOR THE ETA PROJECT TO MATCH IDENTIFIED EDUCATIONAL NEEDS

Both the DOE Planning and Evaluation Survey and the Telecommunications Alternatives Survey provided considerable input and substantiation of the direction being taken by the ETA proposal design team. Five important needs that could be significantly supported by telecommunication and computer technologies were the foundation of the proposed Project:

- NEED #1: To establish an administrative and instructional communications network characterized by interactive capacity, minimal on-site support personnel, and cost-effectiveness.
- NEED #2: To establish a method for rapidly accessing repositories of a wide variety of instructional materials and related information.
- NEED #3: To provide individual student diagnostic services, especially in the areas of reading and computational skills, and to do so on an as-needed basis.
- NEED #4: To provide direct instructional support in those situations where limited staff required the teacher to serve in the role of facilitator rather than teacher, per se.
- NEED #5: To provide teacher in-service training and teacher support in a manner that does not always require physical relocation of the staff.

To meet these needs, the entire range of transmision alternatives from one-way audio to two-way video was considered. The telecommunications formats evaluated were:

- Audio-simplex (one-way) - (1)
- Audio-duplex (two-way) - (2)
- Radio - (3)
- Computer information and data - (4)
- Television - (6)
- Television and two-way audio - (7)
- Television and teleconferencing (interactive) - (12)

The numbers in parentheses indicate the comparative satellite earth station and satellite transponder costs. When these seven telecommunications formats were compared with the five educational needs, the two-dimensional matrix of Table 2 resulted.

TABLE 2

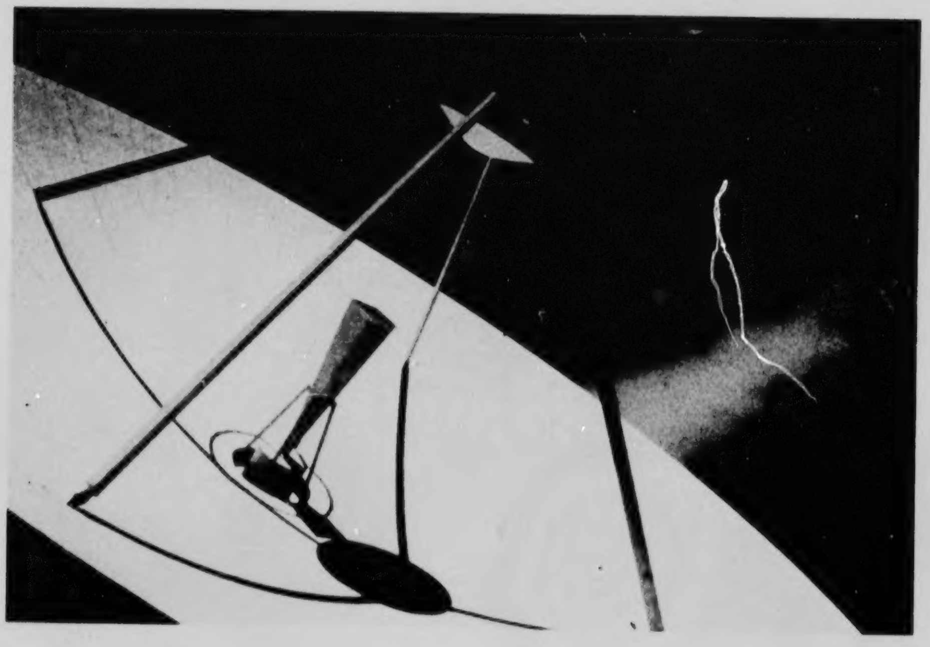
TELECOMMUNICATIONS FORMAT

Educational Need	Audio Simplex	Audio Duplex	Radio	Computer Information and Data	Television	Television and Two-Way Audio	Television and Teleconferencing
1. Administrative Communications		X		X			
2. Resource Identification and Transmission		X		X			
3. Student Diagnosis		X		X			
4. Classroom Instructional Support		X	X	X			
5. Staff Training and Support		X	X	X			

The selected formats are indicated by an "X." The selections were based on the following two criteria:

- The telecommunications medium selected to meet each need must provide a technically appropriate solution to the need and be acceptable to the ultimate users of the system; and
- Where alternative media could be brought to bear on the solution of a particular need, the most effective alternative affordable would be chosen.

The selected transmission formats were all narrowband (requiring small amounts of frequency spectrum). Each was widely used and took maximum advantage of what was already in place. None of the last three telecommunications formats was selected. The reason was economic – it was too expensive to upgrade the earth stations, pay the yearly cost of a transponder, and purchase, install, and maintain the necessary television-associated equipment for full-motion video.



ADMINISTRATIVE COMMUNICATIONS NETWORK

THE FEDERAL AND STATE COMMITMENT

The Educational Telecommunications for Alaska (ETA) Project was designed to address several of Alaska's critical educational needs through the judicious application of telecommunication and computer technologies. The educational needs were determined by the Alaska Department of Education in its comprehensive survey conducted in 1976.

Recognizing that to develop, test, and begin to institutionalize a technologically supported educational system was a long-term effort, both NIE and the Alaska DOE agreed on a four-and-one-half year project. To ensure continuity, Letters of Agreement were exchanged between the two organizations committing resources over that period of time. The funding was to be heavily Federally supported at the onset with the burden shifting to Alaska during the later years. By the end of the Project, two-thirds was to be supported by DOE. Beginning in January, 1982, total responsibility would be borne by the State.

In July, 1977, DOE formally submitted a letter to the NIE Contracting Officer stating that the Commissioner was committed to seeking funds to support the ETA Project according to the following schedule. Federal and State support by Project Year is shown.

Project Year	**Federal Support**	**State Support**
9/77 - 12/78	$1,600,000	$225,000
1/79 - 12/79	900,000	583,000
1/80 - 12/80	600,000	958,000
1/81 - 12/81	300,000	945,000
1/82 - 6/82	-0-	345,000

Federal support officially terminated on December 31, 1981. The $345,000 shown commencing in January, 1982, is estimated to be the yearly State-supported maintenance-level cost. Other costs will be covered by the user communities.

ADMINISTRATIVE COMMUNICATIONS NETWORK CONTEXT

ETA PROJECT GOAL AND OBJECTIVE

The educational needs are a direct outgrowth of problems associated with distance, isolation, climate, and sparse population. Modern telecommunications, primarily satellite communications, recognizes no geographic or weather barriers. It is relatively inexpensive and experience has shown that interaction via telecommunications can well substitute for many business and social face-to-face meetings.

The recommendations of the DOE's "Planning and Evaluation Survey" and OT's "The Telecommunications Alternatives Survey" were analyzed and resulted in three fundamental needs that could be addressed by the technology:

- to establish an administrative and instructional support communications network characterized by interactive capacity, minimal on-site support personnel, and cost-effectiveness;
- to establish a method for rapidly accessing repositories of a wide variety of institutional materials, resources, and related information; and
- to provide direct instructional and teacher support to rural secondary schools in those situations where limited staff requires the teacher to serve in the role of facilitator of learning rather than providing direct instruction in the conventional sense.

Based on these needs, the Project established as its overall Goal: "An educational telecommunications network installed and operating statewide which is responsive to Alaskan needs and provides equality of access to quality educational programs and support services."

The Project's immediate Objective, to be achieved in the four-and-one-half years of Federal and State joint sponsorship, was: "A model educational telecommunications network developed and implemented containing user accepted, proven, affordable, and effective components." The three components comprising the Project which directly support this Objective were:

- Administrative Communications Network;
- Resource Identification and Retrieval System (later renamed "Alaska Knowledge Base System"); and

- Individualized Study by Telecommunications.

This report documents the implementation, evolution, and institutionalization of the "Administrative Communications Network."

ADMINISTRATIVE COMMUNICATIONS NETWORK EXPECTED RESULT

Problems of administrative support between DOE, school district offices, Regional Resource Centers (RRC), and local schools are exacerbated by geography, weather, sparseness of population, and the four time zones spanned by the State. Telephone communication is very difficult at times and polling all superintendents in a day is almost impossible. Interaction between DOE and rural schools is hampered by the slowness of mail delivery which can range from two days to two months. Communications on basic record keeping, forms transmittal, and information transmission become hopelessly bogged down in the turn-around time of mail delivery. Thus, from the outset, all concerned parties - Federal, State, and local - agreed that the model system developed to overcome these problems would contain all the elements of the eventual statewide system. The purpose was to develop a microcosm of the final Network, then to test and evaluate the elements so that expansion could proceed based on a test-bed of proven performance. The following Expected Result was established for the Administrative Communications Network:

> "A model administrative network among and between DOE, school district offices, RRCs, and some local schools supported by telecommunications provides more efficient management by permitting timely input and greater communication and field participation."

Associated with the Expected Result were a series of Verifiable Indicators to be used as measures of the model's success. These Indicators became the basis for future evaluations of progress. Successful accomplishment of all Indicators marked achievement of the Expected Result and thus, successful component completion. The Indicators specified are listed below:

- *BY 1980*
  - 90 percent of the districts in the State will have ETA terminals and use them to communicate with other agencies at least every other day;
  - at least two reports are electronically transmitted to the Department of Education from 50 percent of the local education agencies during that year.
- *BY 1981*
  - at least four reports are electronically transmitted to the DOE from 65 percent of the local education agencies during that year;
  - 80 percent of the district administrators feel that the statewide Administrative Network is valuable and are willing to expend local resources to ensure its continuance;
  - communication and reporting of information will be improved substantially as attested to by the users.
- *BY 1982*
  - at least 70 percent of the district administrators wish to continue reporting to the Department of Education through the electronic transmission of data;
  - the costs associated with the Administrative Network are affordable and acceptable to 90 percent of the users;
  - 70 percent of relevant user communication needs are being met by the Administrative Network;
  - the technical quality of the Network is adequate to support its defined uses.

It was recognized from the beginning, however, that there were factors outside the control of the Project that could adversely impact on achievable performance. Therefore, "Assumptions" were listed that were tracked along with accomplishments in order to evaluate performance. This is an essential element in making a proper judgment about the introduction of any innovation. The "Assumptions" associated with the Administrative Communications Network were:

- Critical personnel can be recruited and retained in Juneau.
- Local and long-distance intrastate line quality is sufficient for the development of required telecommunications links.
- RCA Alascom tariff rate structure does not exceed budget limitations.
- Equipment is rugged enough to operate reliably in the Alaskan environment.
- The telecommunications program at the National Institute of Education or alternate Federal agency continues to be viable for the term of the Project.
- Federal funding is available at the designated level and on schedule.
- The DOE is willing and able to adapt to new procedures required by the telcommunications system.
- DOE response capacity is not exceeded by a speed-up of information flow.
- State, regional, and local agencies are willing and able to pay for the continuance of the telecommunications network on an institutionalized basis.

Along with establishment of the Expected Result, Indicators, and Assumptions, a Performance Network was developed for the Administrative Communicatons Network. Figure II-1 (fold-out appears at end of Volume) charts the key events to be accomplished over the life of the Project. This Performance Network was an outgrowth of the network used by the Federal Project Manager to monitor only events deemed significant to the sponsoring agency. Also noted are documents to be delivered to that sponsoring Federal agency, other involved organizations (e.g., the Alaska State Legislature), and work to be performed under the auspices of outside organizations. A brief explanation of the key events is contained in Appendix A.

EVOLUTION OF THE ADMINISTRATIVE COMMUNICATIONS NETWORK

One of the most important purposes this report can serve is to document the evolution of the introducton of this innovative Network into the educational life of Alaska. The adoption of an innovation that will eventually transform the way education is provided and administered is a rarity–an occurrence which should be presented in detail so that others may adopt and/or adapt what has been learned to their own situations and circumstances. The Administrative Communications Network has undergone a number of changes since its original concept. These changes have been brought about by successive evaluations of user reaction to the System. Equally important, however, the Network has had to adapt to external forces as well, in order to survive. Recognizing that this could happen, a set of guiding principles was established at the outset of the Project in an attempt to minimize the impact of such eventualities. When viewed objectively, it is seen that they are independent of any particular project and provide excellent guidance for the introducton of innovation. These principles were succinctly expressed by Dr. William Bramble in his paper, "The Educational Telecommunications for Alaska Project," published in January, 1980:

> "The probability of success with innovation requiring behavioral changes is inversely proportional to the amount of change required. A strategy involving relatively small incremental steps is optimal;
>
> "In implementing a change in behavior of a given magnitude, a reward of relatively equal magnitude must be provided or innovative behavior will not be sustained after the novelty wears off;
>
> "Successful changes in 'process' or technique in education are more probable than in 'content'. Attempts to change both simultaneously significantly diminishes the overall probability of success;
>
> "Any technologically based system must be as fail-safe and user-oriented as possible. Also, the technological subsystems should not be so interdependent that the failure of one subsystem causes the whole system to fail. Technical training requirements for the use of the technology should be held to an absolute minimum;
>
> "The probability of continued use of educational technology is directly related to the degree of

compatibility and support of the environment in which the technology is to be used. In the design of systems and training procedures, the environmental factors need to be taken into account."

INITIAL ORGANIZATION

First steps toward the development of the Administrative Communications Network were taken in 1976 when school personnel at all levels responded to the detailed questionnaire issued by the Alaska Department of Education. In addition, a number of face-to-face presentations were given to administrative and other school personnel to elicit their advice on specific needs. Thus, from the very beginning, concerned field personnel were involved in the conceptual process – an essential step toward gaining acceptance of the innovation.

PROJECT MANAGEMENT

The Project Management structure established was for purposes of implementing three components of the ETA Project: the Administrative Communications Network; the Alaska Knowledge Base System; and the Individualized Study by Telecommunications. However, the discussion that follows will concentrate on how the structure worked with the Administrative Communications Network only.

Policy, utilization, and implementation decisions were vested in the established operating user agencies: State Board of Education, State Department of Education, and the 52 school districts.

Technical support for design, production, and installation was the responsibility of two types of agencies:

- Design and Implementation (D & I) Contractor under supervision of the DOE; and
- Regional Resource Centers (governed by participating districts).

As the Project matured, more and more organizations with specialized expertise were brought in, considerably diminishing the roles of both the D & I Contractor and the Regional Resource Centers.

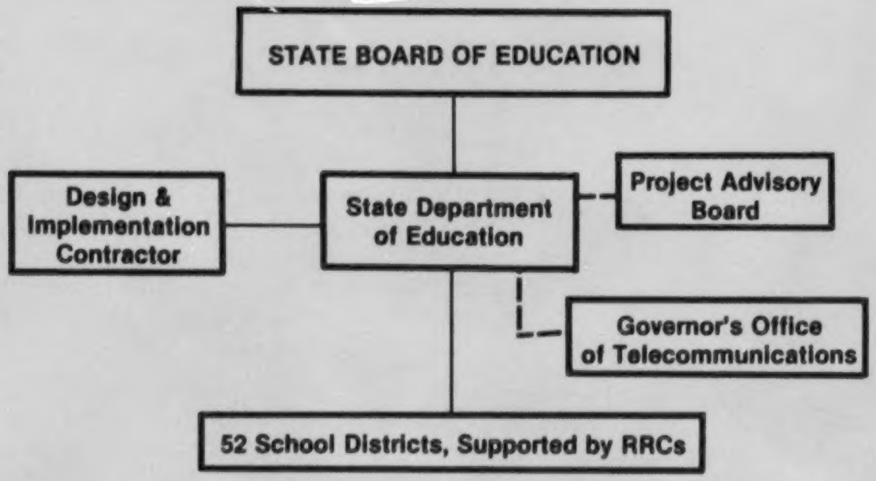
It is important to differentiate policy, utilization, and implementation decision-making from the technical aspects in order that the concept of "user-driven" development and use be maintained. This is essential so that the technology will be responsive and subservient to priority user needs.

The overall structure is shown in Figure II-2.

- *State Board of Education*–ensured that Project policies and procedures were consistent with statewide policy and priorities, and approved annual and long-range scope of work plans.

Figure II · 2

OVERALL EDUCATIONAL STRUCTURE
STATE OF ALASKA


STATE BOARD OF EDUCATION
Design & Implementation Contractor
State Department of Education
Project Advisory Board
Governor's Office of Telecommunications
52 School Districts, Supported by RRCs

- *State Department of Education* – was responsible for overall Project planning, monitoring, and Network evaluation. Based upon advice of a Project Advisory Board, the Governor's Office of Telecommunications and the school districts, the DOE set priorities for types of utililzation and implementation modes, for development of annual and long-range scope of work plans for State Board approval, and for evaluation. The design of the evaluations evolved from interaction between the D & I Contractor, and Project and district personnel. Data acquisition was the responsibility of the D & I Contractor; and analysis, a joint responsibility with the DOE. In addition, DOE was responsible for maintaining statewide interagency coordination, communications and support mechanisms, and legislative liaison.

- *Local School Districts* – were responsible for providing input to DOE regarding types and modes of utilization, for developing Network protocols to determine local levels of utilization, for determining levels of supplementary local support to maintain the Network, for defining the role of the RRCs in its utilization, and for providing formative and summative evaluation data to the D & I Contractor.

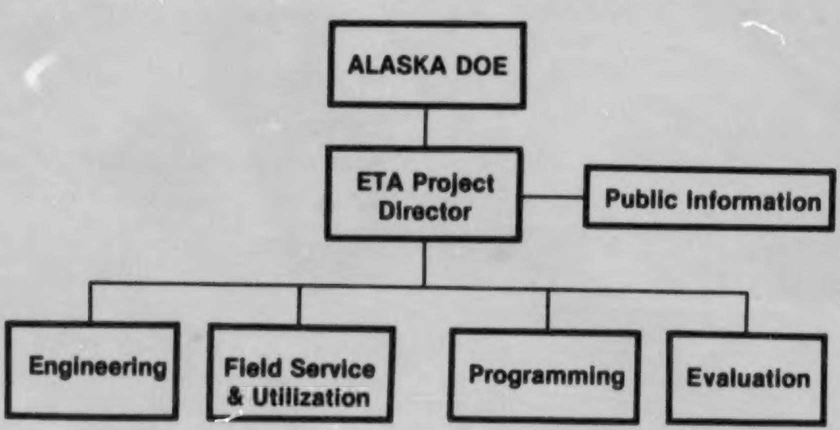
- *Regional Resource Centers* – had microcomputers installed for their own use and for support of cooperating districts. They also trained personnel in the use of the Network. Since local districts had the option to cooperate with RRCs or not (Senate Bill #690), the specific nature and operational style of cooperation efforts varied from region to region. Districts that did not become associated with RRCs still had access to the Network.

- *Design and Implementation Contractor* – (Northwest Regional Educational Laboratory) – was responsible for supervision of technology installation and maintenance and evaluation design, data collection, and analysis. The Contractor was equipped with Network components similar to those at user sites and remained in constant contact with all participating sites. Thus, problems could be detected quickly.

Because of the small specialized staff available, the Project was organized along functional lines. This was the management structure selected because (1) functional goals could be clearly defined; (2) the parent organization (DOE) is organized along functional lines; and (3) the D & I Contractor tasks could be well defined and subject to standard Management by Objective techniques. This structure is shown in Figure II-3. The functions performed by the D & I Contractor are displayed in the last row of blocks.

Figure II - 3

FUNCTIONAL ORGANIZATIONAL STRUCTURE



EVALUATION DESIGN

Although the formal evaluation documents were issued in September, 1978, portions were used as the guiding instruments from the outset of the Project, approximately a year earlier. Two documents formed the basis for all evaluation designs, data collection, and analysis throughout the four-and-one-half year life of the Project. These documents, issued by the DOE and NWREL on September 29, 1978, were entitled "Evaluation Design for the Educational Telecommunications for Alaska Project" and "Summative Evaluation Design for the Educational Telecommunications Alaska Project." Those portions applying to the Administrative Communications Network are summarized here.

FORMATIVE EVALUATION DESIGN

"Evaluation Design for the Educational Telecommunications for Alaska Project" set forth the guidelines for continuing formative evaluation the purpose of which was to provide adequate and appropriate information in a timely manner in order to assist management in informed decision-making. The three primary elements of the conceptual evaluation plan were:

- documentation of program activities, events, incidents, and progress to serve as a data base for evaluation activities;
- identification/prioritization of program issues and needs requiring intensive analysis;
- studies of high priority items deemed important by Project management.

An operational evaluation was constructed each year, based on the global conceptual design. This evaluation was subject to continual review by Project management to ensure that it was providing useful information. If it did not meet management's needs, it was modified and a revised plan constructed.

Six areas were used as the model for the yearly operational evaluation designs:

- *Considerations in the Development of the Evaluation*
  - Policies and Constraints
  - Expected Results
  - Activities and Verifiable Indicators
  - Suggested Areas to be Assessed
    - User Acceptance
    - User Needs
    - Timeliness
    - Cost
    - Technical Systems
    - Training
    - Performance of Involved Agencies
  - Groups to be Served by the Evaluation
  - Criteria for Decision-making
- *Collection of Information*
  - Sources of Information
    - Written Synopses
    - Records
    - Questionnaires
    - Interviews
    - Financial Records

    - -- Observations
    - -- Performance Indicators
    - -- Studies on Specific Activities
  - - Design of Instruments and Methods for Data Collection
  - - Sampling Procedures for Collection of Information
  - - Conditions and Schedule for Information Collection
- *Organization of Information*
- *Analysis of Information*
- *Reporting of Information*
  - - Audience to Receive Information
  - - Means of Providing Information
  - - Format for Information Dispersal
    - -- Weekly Newsletters via the EMS
    - -- Quarterly Newsletters or Brochures
    - -- Documentation Reports
    - -- Executive Summary/Final Report
  - - Schedule for Reporting
- *Administration of the Evaluation*
  - - Evaluation Schedule
  - - Staff Requirements and Roles
  - - Budget Requirements
  - - Scope of Work

SUMMATIVE EVALUATION DESIGN

The summative evaluation design, as presented in "Summative Evaluation Design for the Educational Telecommunications Alaska Project," followed the same outline as that of the formative evaluation. However, its purpose was to determine the overall effectiveness of the Project and its component parts. The specific questions to be answered relative to the Administrative Communications Network were:

- Do users accept the Network?
- Does the Network meet users' needs?
- Does the Network aid in communicating and reporting information?
- What are the costs associated with this Network?
- What is the technical quality of the Network?
- What are the training requirements to operate the Network?
- How has the performance of other agencies affected the Network?
- What is the comparison with the postal service?

- What were the types of messages and types of users?
- What local adaptations occurred?

Collection of summative evaluation information was piggy-backed on collection of data for the formative evaluations since many of the same questions were relevant to both.

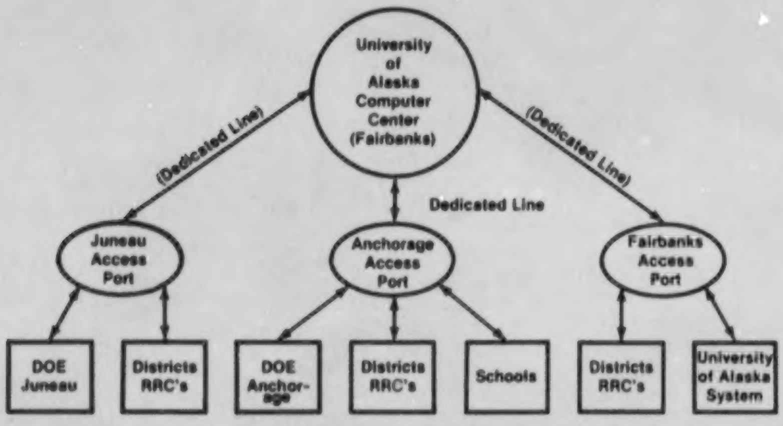
INITIAL ELECTRONIC MAIL SYSTEM

The proposal to the National Institute of Education (January, 1977) stressed the need for a "core communication network." The proposal suggested the use of an electronic "mail-drop" system to facilitate school administration at State and local levels. This led to the development of the ETA Electronic Mail System (EMS). The proposed participants were the 52 district offices, Regional Resource Centers, two DOE offices, and the University of Alaska Computer Center. Network participation was to be expanded to include school sites in the third and fourth Project years.

Figure II-4 schematically represents the Network as proposed. Information flow was to be controlled by the University of Alaska computer which would contain the individual user's file ("mailbox"). Each user was to be allocated a specified portion of computer memory exclusively for his/her use. Messages were to be entered by any user with a proper and active identification (ID) number and could be addressed to any active recipient's file. Each user could check his/her mail file in order to determine if messages had been received and could then enter messages if desired. Access to the "mail-drop" computer was to be through special telephone lines or access ports in Juneau, Anchorage, and Fairbanks, Users were to phone up the nearest access port from their on-site terminal locations. Satellite communication links would use the RCA Satcom satellite and commercial earth stations maintained by RCA Alascom.

Figure II - 4

ADMINISTRATIVE COMMUNICATIONS NETWORK DIAGRAM


University of Alaska Computer Center (Fairbanks)
(Dedicated Line)
(Dedicated Line)
Dedicated Line
Juneau Access Port
Anchorage Access Port
Fairbanks Access Port
DOE Juneau
Districts RRC's
DOE Anchorage
Districts RRC's
Schools
Districts RRC's
University of Alaska System

Key features of the initial Electronic Mail System proposed to NIE were:

- use of an existing computer facility at the University of Alaska at Anchorage;
- use of the "mail-drop" system existing in the University computer;
- use of very simple (dumb) terminals at user sites in order to make the system easy to use, to keep site costs low, and to hold maintenance to a minimum;
- users were to interact with the system on a real-time basis, i.e., messages were composed and sent or received during a telephone call. This approach also allowed for the simplest and least expensive on-site terminals.

EXPLORATORY TEST

An Exploratory Test was conducted beginning in late 1977. Participant sites were selected based on responses to letters sent to all district office superintendents. Those expressing interest and whose offices were equipped with telephone facilities or who had access to a "bush" village satellite telephone were selected. Ten villages, the South Central Resource Center in Anchorage, the South East Regional Resource Center in Juneau, NIE, and Northwest Regional Educational Laboratory constituted the user community in this initial test. The participating villages were Angoon, Hoonah, Haines, Wrangell, Kodiak, Naknek, Kotzebue, Clear, Tok, and Mountain Village (Bush Village SATPHONE).

In preparation for the Exploratory Test, participating administrators, their secretaries, and other school personnel were trained in the use of the Mail System. Each user of the System was provided the "ETA Mail System User Handbook." It was written in a simple, conversational style in order to make the inexperienced user feel comfortable. As with any good design, the intent of the authors of the Handbook was to make it very "user friendly." Since the initial concept was for users to always interact with the mail-drop computer in an on-line, real-time basis, there was little need to present technical details on the terminal or other hardware. One of the most important, albeit peripheral, features provided was the Suggestion (Mail) Box. Recognizing that the EMS was a totally new experience to all involved, the Suggestion Box was included so that changes and refinements to the System could be made as users became more familiar with it and began to see how it could meet their own particular needs. Users were encouraged to submit complaints as well as recommended improvements.

A "Postmaster" was made available at all times to assist users with problems. In addition, the Postmaster maintained a current list of users, their addresses, and their identification codes and originated messages relative to the status of the host computer, e.g., down for overhaul on specified days, and other housekeeping duties.

Although the original recommendation had been to use the University of Alaska computer, actual testing of their mail-drop system in mid-January, 1978, showed that the use of terse, abbreviated command language along with cryptic computer prompts (statements generated by the computer requesting additional information from the user) were not suitable for EMS users. A search of other State computer systems found that none were configured for on-line, real-time interaction as required by the initial System concept.

In response to an RFP from the Project, Systems Northwest Corporation of Juneau offered to provide access to their Digital Equipment Corporation PDP 11/70 minicomputer which also supported the Alaskan Marine Highway's reservation and electronic mail systems. A message program was designed with ease of use and acceptability to ETA users stressed in the command language. The System became operational on April 1, 1978. On-site training was conducted at each of the sites. In most cases, the district superintendent and/or office secretary received intensive training in equipment operation and all EMS features.

Data collection lasted four weeks. The results of the short Exploratory Test in three areas were of interest: problem areas, user attitudes, and average time between when a message was sent until it was checked at the receiver end. Information was gathered from all principal users at each site by questionnaire, site logs, staff reports, and interviews. Briefly, the results in these areas of concern were as follows:

- *Problem Areas* - Two sites, Kodiak and Clear, had serious problems, primarily due to the marginal quality of the non-satellite telephone transmissions in their local areas. Four sites reported no problems and four reported only one problem, each of which appeared to be peculiar to the sites themselves and, therefore, could not be generalized.
- *Attitudes* - Only three sites of twelve did not respond with all positive answers to questions relating to ease of operation, improved capability over use of telephone conversations and the mail, and support when troubles were encountered.
- *Time Messages Resided in Receiver's Mailbox* - Thirty percent of all respondents checked their messages within four hours of the time they were sent; 54 percent checked within one day, and 63 percent within two days. The high percentage of those who did not check their mailboxes prior to two days indicated that many messages had been sent on a Friday and were not picked up until Monday.

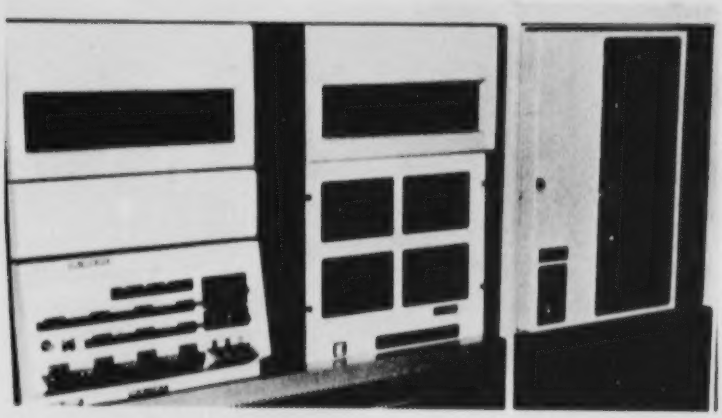
The results of this brief Exploratory Test indicated a high degree of success for the infant EMS and augured well for full-scale implementation. Specifically:

- User attitude was dominantly positive.
- Messages were, in the main, picked up quickly, representing in some instances substantial improvement over mail.

- Non-technical users were easily trained and were comfortable with the System.
- Transmission links provided by the carrier, RCA Alascom, were generally acceptable for data transmission.

The problem of local telephone lines that plagued Kodiak and Clear was later found to be a major cause of problems for many remote sites.

After an additional month of service, the EMS Postmaster conducted a survey basically relating to reactions of the users to their interface with the EMS protocols and features. This survey had an important effect on the finalization of the System because the tenor was one of making it more responsive and "user friendly." Readers of this report will find the user recommendations of particular importance if they are involved now in an electronic mail system for their own specific user group, or should they decide to implement one in the future.



RECOMMENDATIONS

- *Ports*

  A sufficient number of telephone lines should be available to users so that they can dial up the computer at any time for sending and receiving messages, without encountering busy signals.

- *Confidentiality*

  - User names should be related to agency account numbers such that a user in one agency cannot access the mailboxes of another agency without permission.
  - District /agency account numbers should be unique and not in sequence so that one user cannot guess another user's account number on the basis of one's own.
  - Users should have the ability to change their passwords in direct connection with the computer and not through an intermediary, e.g., the Postmaster.
  - Passwords should be masked, both on hard copy and on the display terminal, to avoid detection.

- ***Prompt/Command Structure***

  - The commands established to follow computer prompts should represent meaningful actions or procedures. Users prefer to enter single characters in response to prompts, as long as that character stands for a word that is logical and easy to remember.
  - To reduce the possibility of confusion in responding to prompts at different points in the Mail System procedure, each command should be unique. For example, the command "End" or "E" should only be a response option at one point in the procedure, instead of two or three.
  - Rather than having the aid message print out automatically when a user enters an incorrect command, the computer prompt should simply repeat until the user enters an acceptable response or "AID"; or the "Enter Aid for Help" message could print out when the number of command options is large.

- ***Editing***

  - The most important element in the area of editing is the ability to compose, correct, and amend message text off-line. Users will probably be more inclined to use the System if they do not need to be concerned about the costs of line time while composing messages.
  - It would also be helpful for users to be able to make corrections and insertions in the middle of a message, without having to retype everything that follows a change, and without affecting the hard-copy appearance of the message.
  - Users prefer having visual feedback when correcting words and characters within a line.
  - More extensive prompts are helpful to users during the training period. However, once the editing steps are learned, most users would prefer to be able to utililze shortcuts. As an example, the command "CL6" could be entered by those familiar with the System, thus avoiding a wait for the prompt, "change which line?".

- ***Message Efficiency***

  - As an aid to agency and district operators, there should be a faster way to switch from one mailbox to another, once the user is logged on. Perhaps a message option to "change mailboxes" would be sufficient, although it would still require that the operator know the password for each mailbox used.
  - Receipt of a message should be acknowledged automatically, so that a user could find out which of the messages sent had been printed by the intended recipients - if (and when) that information is specifically requested. Perhaps some messages

could call for a "return receipt" which would require action on the part of the person receiving the message.

- Users should be able to forward messages from one mailbox to another. This would be particularly helpful in transferring requests for information and for relaying trouble reports. This, or some other message-storing capacity, would also save time in re-sending garbled or "lost" messages.
- The ability to send the same message to more than one mailbox should be enhanced such that the recipient can tell whether the messge received is an informational ("carbon") copy from the sender or a message requiring action or response on the part of several addressees. This information should be part of the message-creation sequence; the sender should *not* have to remember to follow a particular format in the body of the message.

  In addition, when a complete copy of the message is listed as an editing step before sending, *all* the address information should print, not only the body of the message. This would allow the sender to change addresses or subject, without having to recreate the entire message, and it would provide a *complete* printed copy of messages sent for retention in hard copy file.
- Users should have the capacity to save messages without having the message headers print out whenever the mailbox is checked. They should also be able to delete a message by number only, without having to wait for it to print out.

• *Conducting Business*

- Users should be able to make use of standard address lists, as well as to create address lists of their own. Such lists could be stored in a "file" and called up and used or amended as often as necessary.
- Requests for information searches could be handled through a subroutine which would give prompts for all information required to perform a search.

• *Training*

- Complete instructions for equipment operation and problem solving should be provided to the user. Explanation of every keyboard feature should be included in the User Handbook. A simplified troubleshooting guide should also be provided, as well as instructions for differentiating between terminal, phone line, and host computer problems.
- The user directory should be available in the computer for users to call up as needed. User directory updates would be handled automatically and would be available as often as district users cared to print them out.

- Opportunity should be provided for users to meet each other face-to-face and to discuss problems, experiences, and possibly different points of view.
- It would be helpful to have both the full command word and a one- or two-character abbreviation accepted as a response to the computer prompts.

OPERATIONAL PROTOTYPE ELECTRONIC MAIL SYSTEM

As a result of the Exploratory Test findings for both technical and user interfaces, it was decided that changes to the existing Network were too extensive for simple revision. Therefore, new specifications were developed for an RFP covering complete System development. Concurrently, an 87 percent increase in all intrastate long-distance tolls was instituted by RCA Alascom, the State's only long-lines communication carrier. This drastic rate increase made it imperative that an alternative to conventional real-time, on-line interactive processing be found. If not, communications costs would eventually drive users away.

The EMS design that was developed included microcomputers at user sites and increased efficiency by:

- allowing off-line (performed prior to dialing into the Mail System host computer) pre-processing (editing) of messages at all sites;
- permitting remote control of the site storage devices by the host computer so that telephone on-line time could be reduced;
- performing detached batch processing at the host (permitting the host computer to process messages received from sites after users had hung up the phone);
- supporting both interactive and batch operations; and
- taking full advantage of the high data-rate-handling capability of quality telephone circuits.

This last item was accomplished by collecting the variable-length, low-data-rate messages coming in from the different sites and combining them into a single high-speed digital data stream at specially designated nodal cities (access nodes). Thus, the many inefficiently used incoming telephone circuits were dropped and a single efficient, high-speed circuit was used to carry traffic from the nodal cities to the host computer in Juneau.

EMS OPERATIONS

In the upgraded EMS, users were given the option to work in real-time or non-real time (off-line) with the host computer. The procedure was as follows:

The user dialed into an access node at the closest nodal city and acoustically coupled his/her microcomputer, via the telephone, to the circuit. At the nodal city, the message was combined with those of other messages and carried by the "backbone network" (high-speed data lines) to the host computer in Juneau. By dialing the nodal city, the user considerably reduced the long-distance charges of dialing directly to Juneau. The costs of transmission from access nodes to the host computer (backbone network) were paid for by the State since this was shared with other State organizations. When connected, the user could choose to make requests of the host's storage for current electronic mail, administrative form templates, or any optional process available at the host. All outputs from the host were stored on a magnetic data recorder (floppy diskette) at the user's micro and displayed on the screen (CRT) or printed out, if desired. The purpose of the diskette was to enable the user to review and process the information received from the host *after* hanging up the telephone.

Once the user was logged off the host, he/she could proceed in the off-line edit mode. At this time, hard-copy mail could be produced from the diskette. Form templates could be displayed and edited (filled in). The completed forms thus generated (output data) could be re-recorded onto the diskette for transmission at some later time. Outgoing mail could also be put onto the diskette for transmission.

When ready, the user re-dialed the host computer and the data which had been prepared for transmission would be sent to the host for batch processing. At the end of the transmission, the user logged off and disconnected (hangs up) from the Network. The host batch processor continued to work on the data without any connection to the user's terminal. At a later time, the host computer was re-dialed to retrieve messages and the processing scenario could be repeated once again.

The option of real-time, on-line interaction with the host computer was available for those who wished to use it. In instances, for example, where a search strategy was involved, this mode was essential.

COMPONENTS OF THE EMS

EMS components consisted of a combination of hardware configured for the particular site and functions to be performed, plus the transmission medium. Basically different configurations existed at the user sites, nodal cities, and the host site,

USER SITE

Two types of user sites are shown schematically in Figures II-5 and II-6. (It should be noted that the "terminal" in each instance is a microcomputer as opposed to the "dumb" terminal used previously.) The difference between them lies in the transmission medium used to reach either a nodal city or the host computer site directly. Figure II-5 depicts a microcomputer that is connected to a telephone and from there to a satellite earth station operating in the Super High

Frequency (SHF) band. Figure II-6 illustrates a micro connected to a radio teletype circuit operating in the Very High Frequency (VHF) range. VHF, because it is a lower frequency band than SHF, is more subject to atmospheric disturbance.

Figure II - 5

USER SITE (1)

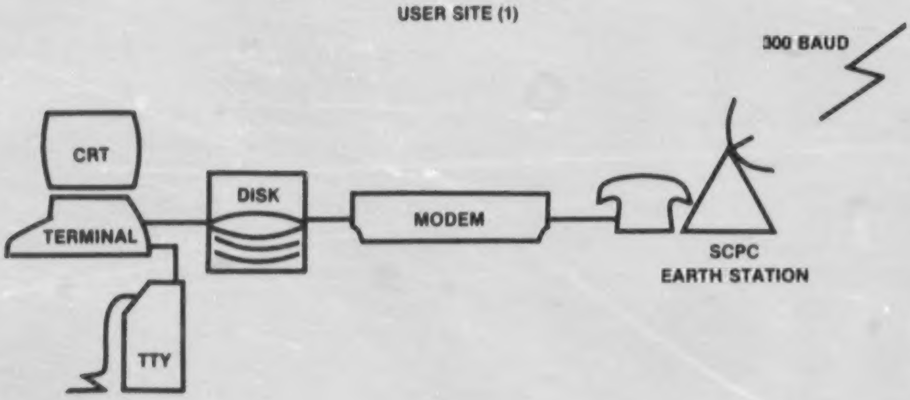
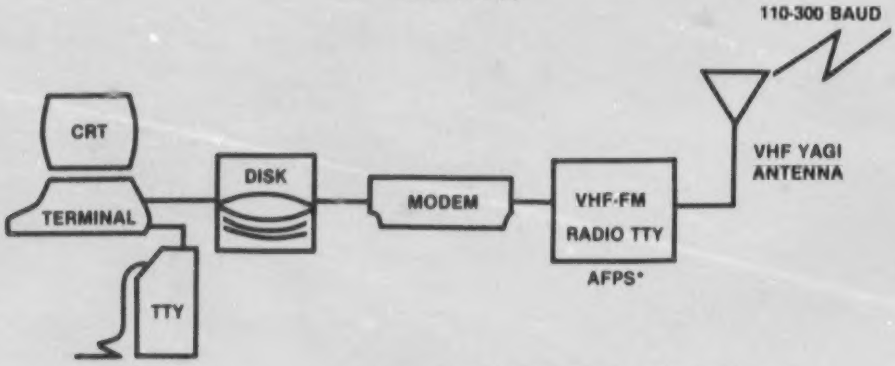

300 BAUD
CRT
DISK
TERMINAL
MODEM
SCPC
EARTH STATION
TTY

Figure II - 6

USER SITE (2)


110-300 BAUD
CRT
VHF YAGI
ANTENNA
DISK
TERMINAL
MODEM
VHF-FM
RADIO TTY
AFPS*
TTY

ALASKA FIXED PUBLIC SERVICE*
"BUSH PHONE"

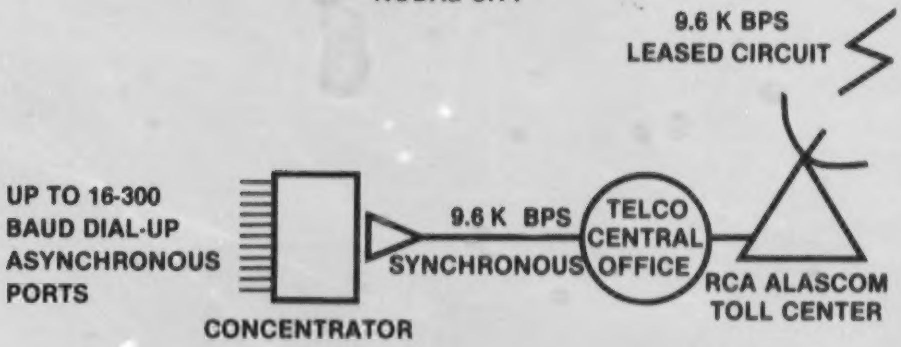
The user worked directly on the micro via its keyboard. The message could be seen on the CRT and/or teletype (TTY) printer. In off-line operation, the microcomputer was not connected to the telephone or radio TTY. The messages generated were stored on the disk shown. When the user decided to send a message, he/she would dial the telephone or, in the second case shown, activate the radio transmitter. When the host computer acknowledged the connection, the message(s) was read off the disk into the modem where it was formatted into the proper digital form for use by the concentrator at a nodal city or by the host in Juneau. In on-line operation, the telephone or radio TTY was active during the entire process. In receiving messages, the user could choose to store the information on the disk for processing later or display it directly on the CRT and/or TTY printer.

NODAL CITY

Figure II-7 displays the equipment configuration at a nodal city. The function of this equipment was to collect messages from a variety of users and convert them into a single data stream for more efficient use of the communication circuit capacity available. Thus, incoming messages were fed into the concentrator, a device which generates a single 9,600 bits per second (BPS) data stream from a number of incoming 300 BPS messages. The output of the concentrator could pass through a local telephone company central office, as shown, and from there to a satellite earth station, or it could be routed via a microwave link to the host.

Figure II · 7

NODAL CITY



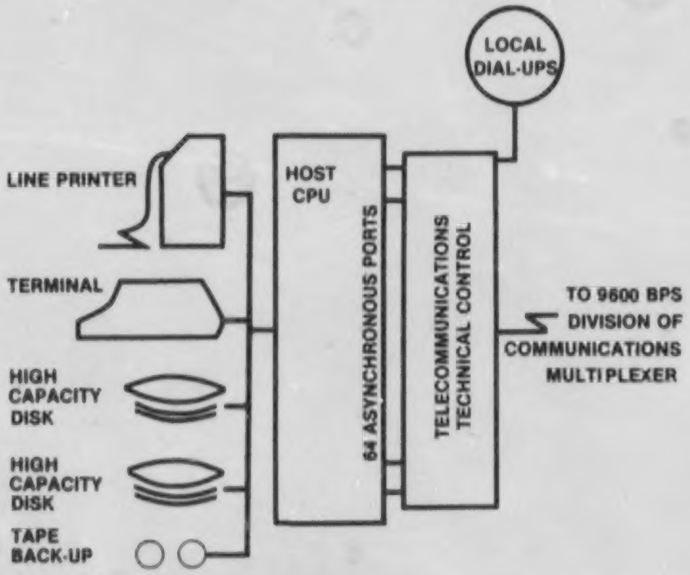
HOST COMPUTER SITE

The host site (Figure II-8) could accept inputs in the form of a 9,600 BPS signal from the concentrator and 300 BPS from individual sites simultaneously. The 9,600 BPS signal was broken down into the original messages and fed to ports (entry points) of the computer. Information was stored on high-capacity disks for batch processing. Information addressed to the host, or network monitoring information, could be printed out on the line printer. The terminal shown could be used for interfacing with the host computer.

The host used in the EMS was provided by the State Division of Data Processing through purchase of a Digital Equipment Corporation PDP 11/70 computer. This computer handled user-composed messages by detached batch and on-line operations. A back-up was installed in the Department of Transportation Marine Highway System. The host could support up to 64 simultaneous users. The key to efficient network operation was to utililze the PDP 11/70 in a detached batch mode which allowed the host to process messages off-line. The software system that supported this was called the "Shared Link Detached Batch" (SLDB). This process could take place during non-peak hours, thus permitting the computer to maximize its workload. This was also the least expensive cost option for the users with regard to communication charges.

Figure II - 8

HOST COMPUTER SITE


LOCAL DIAL-UPS
LINE PRINTER
HOST CPU
64 ASYNCHRONOUS PORTS
TELECOMMUNICATIONS TECHNICAL CONTROL
TERMINAL
TO 9600 BPS DIVISION OF COMMUNICATIONS MULTIPLEXER
HIGH CAPACITY DISK
HIGH CAPACITY DISK
TAPE BACK-UP

EMS SOFTWARE

The heart of the EMS was the program (software) that controlled the host computer and therefore established the Network operation. Some of the key features of the software were:

- a command driver which enabled electronic mail to enter the host computer through interactive timesharing or through the highly efficient SLDB;
- a powerful text editor invoked during message composition and written such that the command function was identical to the one implemented at the user sites;
- user-composed and standard System group addresses which allowed selective broadcast of a single message to multiple users;
- a message-selection capability designed to enable users to limit messages actually transmitted to them, thus reducing on-line time;
- a forwarding capability which permitted a mail recipient to route the original text to another user without requesting the message;
- a common File Processor which kept the host data base within the limits of size permitted by peripheral equipment. Statistical

data were kept daily which permitted the System manager or Postmaster to analyze traffic file volumes;

- protection of confidentiality.

A short description of the software is contained in Appendix B.

FIRST STEPS TOWARD INSTITUTIONALIZATION

At this point in time, the ETA Project Office began to put in place mechanisms aimed toward eventual assumption of responsibility for the Network by the users and operational agencies of the State. The intent was that, as the EMS became more operational, more responsibility for hardware, maintenance, and the communication links themselves would be transferred until it was totally user- and State-supported. Initial steps taken were:

- User Agreements (Appendix C) consisting of:
  - "Memorandum of Agreement" between the Department of Education and the user for use of the EMS;
  - "Conditions for Use" document briefly setting forth the users' and DOE's responsibilities;
  - "EMS Policies" setting forth policies that would govern use of the System.
- Other Agency Involvement:
  - Division of Communications, Alaska Department of Transportation and Public Facilities, was involved in the Network design process and became responsible for purchase and leasing of its hardware and communications circuits. The Division developed and installed the "backbone network";
  - Division of Data Processing, Alaska Department of Administration was responsible for purchase, installation, and maintenance of the host computer and microcomputers used by the school districts.

FORGING THE FRAMEWORK FOR OPERATIONAL STATUS

The Network changes necessitated by the findings of the Exploratory Test included major hardware, software, and communication network changes. This in turn impacted heavily on user training methods and content, on local site hardware maintenance requirements, and on what was expected of the users in the way of local troubleshooting. It also impacted the communication network requirements and the host computer.

The original schedule proposed in the National Institute of Education proposal called for EMS protocols and training system to be made final by the end of September, 1978; terminals were to be installed and users trained by October, 1978. With the extensive changes, neither hardware nor software was ready until the end of the first quarter of 1979. The decision was made, therefore, to provide the training and to shorten that training period as much as possible, consistent with the availability of the hardware and software. A major consideration in this decision was that the other two components of the Project, the Alaska Knowledge Base System and Individualized Study by Telecommunications, depended upon the EMS network, especially the Alaska Knowledge Base System.

It was very clear, therefore, that an intensive training program had to be mounted in the 52 school districts, Regional Resource Centers, and at DOE. It was obvious, further, that a comprehensive evaluation would be necessary in order to identify and rectify detected problems.

EMS OPERATOR TRAINING

Host computer and site equipment procurements were run concurrently with the EMS software rewrite. As a result, the host, equipped with the new software, became available by mid-January, 1979. In March, almost half the anticipated 61 sites were equipped with new microcomputers capable of off-line message composition and storage essential to Shared Link Detached Batch operation. The task facing the trainers was to train at least two operators at each of the 61 sites between January and mid-June. Their task was even more difficult because the software developers could not include specific protocols for transmission of pre-recorded message batches as part of the EMS programs written in the fall since, at the time, it was not known what type of micro would be needed at the user locations. Thus, the training team was unable to prepare written instructions for the users about micro operation. In addition, since the Electronic Mail System was introduced late in the school year in many instances, it did not become fully integrated into the normal course of business in many of the school district offices. However, time was still an overriding priority. How this task was accomplished, therefore, is worthy of study by readers of this report since it contains many "Do's and Don't's" that will be valuable for others involved with such systems.

Training of Electronic Mail System users took place in two segments. The first of these was for the purpose of exercising the newly installed EMS software with multiple users during a "trial period." The second was the "statewide effort" to bring all districts and other users on-line following installation of permanent microcomputer equipment at each location. The training was conducted by ETA regional coordinators operating out of the Southeast, Southcentral, and Interior Regions. When it became apparent that the full training effort could not begin until late in the school year, additional trainers were hired at the South East and Bristol Bay RRCs to provide assistance to the regional coordinators in meeting training schedule deadlines.

EMS TRIAL PERIOD (SOUTHEAST REGION)

The trial period was begun early in January, 1979. Although the PDP 11/70 with EMS software was installed in Juneau in December, 1978, the installation of microcomputers did not begin until February or March. In order to make use of the available host system, portable micros were rented for use by each of the Districts in the Southeast Region until such time as the permanent equipment could be installed.

Betwen January 9th and February 21st, portable units were delivered to 16 Southeast school districts, the South East Regional Resource Center (SERCC), and the DOE. Two spare units were kept on hand in the event a replacement was needed for a failed unit. Only five of the units had the capacity for interactive use (Texas Instruments Model 745). Therefore, these were used only at locations where a local call was necessary to access the ETA computer:

Greater Juneau School District
Ketchikan Gateway Borough School District
Annette Island School District
Southeast Island School District
South East Regional Resource Center

The remaining 15 units had the capacity for pre-recording and storing message text and for playback in batch transmission (Texas Instrument Model 765). These were used at the locations where a long-distance phone call was required for sending EMS messages:

Chatham Strait School District
Craig City Schools
Haines City Schools
Hoonah City Schools
Hydaburg City Schools
Kake City Schools
Klawock City Schools
Petersburg City Schools
Sitka Borough School District
Skagway City Schools
Wrangell City Schools
Yakutat City Schools

Most of the training was conducted by three trainers between January 9th and 25th. A two-day visit was required at those sites utilizing the batch recording and sending features. Usually, a primary EMS operator and one back-up operator were trained to use the portable units. Trainers made sure that participants understood that the use of the micros was temporary, and that problems were likely to occur during this developmental phase. Thus, between the end of January and late March, operators in Southeast exercised the host computer and its new software until such time as the remaining sites were able to begin the statewide test.

STATEWIDE TRAINING

In February, 1979, Transalaska Data Systems, Inc. (TADS) was selected as the permanent microcomputer vendor. The equipment selected was the GNAT System 9. Within several weeks, 15 installations were completed at:

Division of Data Processing
Department of Education
Northwest Regional Educational Laboratory
South Central Regional Resource Center
South East Regional Resource Center
Fairbanks North Star Borough Schools
Yukon Koyukuk School District
Nenana City Schools
Delta Greely Schools
Copper River School District
Alaska Gateway School District
Valdez City Schools
Matananuska-Susitna Borough Schools
Alaska Central Railbelt Schools

Because of the need to complete training before the end of the school year, the decision was made not to wait for the installation of the software protocols being developed for batch transmission from the permanent local-site micros (GNAT System 9). Instead, temporary software was written for the GNAT which allowed it to simulate the portable units that were used for the trial period in the Southeast Region. TADS provided the ETA regional coordinator and one additional trainer two full days of training in operation and maintenance of the micro during the first week in March. Training materials were quickly developed, based on the temporary configuration of the units and the portable simulator software. Between March 19th and 30th, personnel at all but three of the above sites were trained with the portable unit-simulator package.

During this period, the three experienced trainers and two additional trainers were forced to intensively review and learn:

- EMS software routines;
- equipment operation and maintenance;

- batch recording and sending procedures;
- Wordmaster editing steps;
- data phone operation;
- trouble-situation remedies;
- on-site training format;
- district interface;
- ETA Project background and information dissemination.

The remaining statewide training efforts began on April 9th and were completed June 14th, 1979, and they included 51 of the 61 sites brought up. The trainers followed the installers as closely as possible, although poor weather conditions, spring vacations, unusable communications devices, and unexpected delays in equipment delivery made numerous schedule changes and repeat visits necessary.

In most cases, a primary EMS operator was designated in each school district office, with from one to ten additional personnel observing and/or participating. In a few cases, the superintendent completed the full training course. The trainers found that dealing with more than two or three trainees simultaneously resulted in confusion and lack of attention on the part of those being trained, and detracted from the level of competency developed by the primary operator(s).

Training took two full days, except in those places where more than one district could be trained at the same time (Nome, Dillingham, and Nenana). Ideally, the period should have been extended over more days with fewer hours per day, but the time available for all sites simply did not permit this.

A significant amount of material was covered in the two days, and the general enthusiasm about the EMS on the part of the trainees and their eagerness to learn something new contributed to the success of the training.

Districts in the Southeast received the permanent Project microcomputers and associated equipment in late April and May, followed by training during May and June. The EMS operators in Southeast had little time to become accustomed to the permanent equipment. The fact that they knew the EMS routines from the trial period, however, and understood the various prompts and commands, gave them a distinct advantage in learning to operate the permanent equipment. The trainers found that they did not need two full days for retraining in most places where the operator(s) had been using the batch record and send modes regularly.

USER HANDBOOK

Two regional coordinators had been involved in both the FY-78 Exploratory Test and subsequent re-design of the EMS software, and were generally familiar with the EMS routines. Utilizing the operating manual provided with the new software documentation, and following the format of the "ETA Mail System User Handbook" used during the Exploratory Test, they were able to draft the written instructions for interactive use of the Mail System routines in December, 1978. The log-on, batch mode, equipment operation, and trouble sections for the complete handbook could not be written until a final decision was made as to the microcomputer for the Project sites.

When it was decided to rent portable units for use in the Southeast Region, the trainers produced a set of instructions and illustrations specifically related to those units. The exercises included in the operator's guide provided by the manufacturer were also used as part of the training with the portable equipment. In addition, a basic checklist was developed as a guide for the trainers.

Observation of the trainees' ability to use the handbook provided the trainers with valuable information as to how to present the step-by-step procedures for the more sophisticated equipment. It became clear that, for the most part, trainees did not want to take the time to read explanations of the steps. Rather, they preferred to have a simple list to follow as a guide throughout the procedures.

A three-column format was adopted wherein the first column described the steps in a numbered list. The middle column showed what prompt (if any) the user sees on the screen during execution of each step, and the third column indicated exactly what the typed response should be. Three different fonts were employed to help differentiate between step descriptions, host computer-generated words, and instructions. This kind of presentation did not convey the amount of flexibility inherent in the EMS but, on the whole, the users found it easy to follow while they learned the steps, and began to explore the other options on their own after they were comfortable with the basics. Many of the trainees commented that they liked the layout of the Handbook and would rely on it for help (ETA Mail System User Handbook, April, 1979).

TRAINER'S MANUAL

The checklist originally developed for use with the portable units was expanded to cover all aspects of the training. The list included:

- supplies to carry;
- on-site equipment check-out;
- demonstration of basic routines;
- batch preparation and sending exercises;

- address list and creation;
- a competency test for trainees;
- a training evaluation questionnaire;
- a non-operator presentation.

The list was particularly helpful to the newly recruited trainers, but was used routinely by all of them in double-checking the points covered ("Trainers' Manual for the Electronic Mail System Using the Provisional GNAT Software," March, 1979).

The training schedule was as follows;

- First Day
    - demonstration of the EMS;
    - orientation to the operation of the equipment;
    - interactive practice.
- Second Day
    - interactive review;
    - batch sending;
    - troubleshooting;
    - special features and options.

TRAINING FORMAT

The guiding principle of the training program was to teach as much as the trainees were comfortable with in the time allowed. The trainers were to:

- teach the basic steps as thoroughly as possible;
- emphasize and encourage the use of batch sending;
- cover special features and options only if it was felt that trainees' would benefit from, and not be confused by, the additional information.

In most cases, the first obstacle to overcome was the trainees' fear of the equipment. After they discovered the computer would "talk" to them, and that they would do no irreparable damage by pressing a few buttons, trainees usually relaxed and enjoyed the sessions.

Communications difficulties from many locations (especially between April 19th and 25th), EMS software irregularities (predominant during much of May), and occasional hardware failures affected the orderly flow of the training at approximately 40 percent of the sites. When the communications network failed, for example, or when the dial-up node at an access city was not operating, trainees were obliged either to dial directly to Juneau to access the computer, or to cover other aspects of the material (out of the normal sequence) until the problem was remedied. In those cases where software modifications were being implemented concurrent with field training, trainers often encountered problem situations that were new to them as well as to trainees. Overall, however, trainers were commended for their patience under such circumstances and for their ability to remain flexible in their presentations.

A slide-tape show about the entire ETA Project was shown, not only to trainees, but to available staff teachers and interested community members (an element that was brought in at every opportunity throughout the Project's implementation). Two printed brochures were distributed to observers and attending community members after April 19th (the third week of training), another attempt to make comfortable everyone who could possibly be affected. One brochure described the three components of the ETA Project; the other addressed specific administrative applications of the EMS.

TRAINING EVALUATION

Each of the trainers was provided a supply of questionnaires to be distributed at the conclusion of the training visit in an attempt to assess the trainees' overall reaction and to help determine which areas needed to be covered better or differently at the remaining sites.

The single most unsatisfactory element in the training effort was the timing. The districts had been waiting most of the school year for installation of the micros and ability to use EMS. By the time the site operators were ready to be trained, the administrative personnel were beginning to make plans for the close of school, graduation, summer vacation, and staff turnover (an especially serious problem in small villages). Many trainees knew thay would not be working in the same place in the fall. Training in late May and June was often presented to a summer staff of one or two, preoccupied with other administrative work or called in from vacation.

Further, because trainers were travelling on tight schedules in an effort to visit as many sites as possible before the close of school, many training sessions were conducted under considerable time pressure. As a result, a second, frequent criticism of the training was that there was "too much to learn at once" and "not enough time to practice," along with related complaints of physical discomfort and eye strain.

Those who commented that not enough time was allowed for the training usually also responded that they felt less than "very comfortable" using the equipment. Others who indicated that they felt more uncomfortable than comfortable with the equipment in many cases were those who had experienced difficulties in dialing to the host computer and in staying connected.

More than a third of those responding felt that all areas of the training were covered well, with log-in and batch procedures listed frequently as having been covered the best. Nearly half the reponders felt that there were no areas poorly covered.

The challenge of learning something new and the "hands-on" experience were listed most frequently as the aspects of the training which respondents liked best. Second to time constraints, telephone communication problems and other unexpected situations were the aspects of the training liked least by those who responded to the questionnaire.

Some had questions about additional applications, trouble situations, and editing but, for the most part, trainees felt that any questions they had or expected to encounter would simply be answered with more practice.

Overall, the training was rated "Good" to "Excellent" by those who responded to the questionnaire. Those who were trained late in the year and who would not be using the equipment over the summer requested additional training at the beginning of the fall term.

PILOT TEST EVALUATION

From the outset of the program, a series of formative evaluations were planned to guide Project management in upgrading the EMS to be as user-responsive as possible. After the major System overhaul brought on by the evaluation of the Exploratory Test in 1978, a second formative evaluation was developed to document the success of the changes and identify further any necessary revisions. It was hoped that this would pinpoint any remaining major problems. Afterward, it was intended to conduct field trials for a full one-year period, perform a final evaluation, and then turn the EMS over to the operational departments of the State and to users themselves. This second formative evaluation was conducted in April-May, 1979.

The reader will recall that the evaluation was conducted during a time of flux when not all the component parts of the System were in place nor was the EMS software completely debugged. The Project duration and the fixed amount of funds that both NIE and the State had programmed to the end of the Project were (as with training) the prime driving functions dictating the timing of this evaluation. Recognizing these factors, great care was taken with construction of the evaluation, and special steps were taken to ensure that the information gathered would be adequate for the data base needed to guide final implementation of the System. As noted in documenting the earlier evaluation, it is recommended that the reader take special note of this portion of the report.

THE EXISTING ENVIRONMENT

Only some of the local microcomputer equipment had been supplied and training completed. Some sites were using portable micros until they received their regular equipment. Other sites had no equipment at all. Throughout the evaluation process, equipment was being installed at the local level.

The host computer equipment was experiencing extensive monitoring and some modification. The main problem was in tuning the computer for better response and disk drive reliability.

The initial EMS software revision improved multi-user access to the host. The programs were again modified in May, 1979. One week of extremely slow response time and inability to properly retrieve messages was experienced during this modification. It was also during this time that it was attempted to send some of the evaluation's test messages which resulted in an excessive number of disconnects and the inability to send messages reliably.

The communications network was also being tested and modified. As sites began to communicate with the host computer, various problems were discovered. These troubles were recorded and personnel from the Division of Communications, Department of Transportation and Public Facilities, or Transalaska Data Systems, Inc. worked to solve them.

During the evaluation, many of the people using the Network were still unfamiliar with the EMS procedures. These errors rapidly decreased as familiarity with the System increased.

EVALUATION PROCESS AND RESULTS

Because of its importance, 50 percent of the evaluation effort was devoted to documentation of program activities, events, incidents, and progress; 25 percent was related to identification/prioritization of issues and needs; and 25 percent was devoted to study of the EMS impact on users.

Ten questions guided the evaluation:

- Do the users accept the System?
- Does the System meet the needs of the users?
- Does the System aid in communicating and reporting of information?
- What are the costs associated with the System?
- What is the technical quality of the System?
- Was the training of users adequate?
- How has the performance of other agencies affected the System?
- What is the comparison between the EMS, phone service, and the U.S. postal system?
- What was the volume of messages by type and source?
- What local adaptations of the System occurred?

The data-gathering techniques used were:

- an experimental study of the communications network itself;
- the Postmaster's troubleshooting log;
- an EMS user's questionnaire;
- EMS cost data;
- an experimental message study comparing EMS, telephone, and postal service.

THE EXPERIMENTAL COMMUNICATIONS NETWORK STUDY

PURPOSES:

The purposes of this activity were to:

- determine the technical quality of the Network between the message originator and the receiving site; and
- determine how the performance of the Network was affected by the performance of each agency/organization.

PROCEDURE

Six sites (SERRC, DOE, Ketchikan, Fairbanks, Bristol Bay RRC, and Tok) were provided pre-recorded floppy diskettes. Messages were 1,400 and 2,800 characters long and contained alphanumeric characters. Each site was asked to transmit the pre-recorded message at specific times on specific days. Each site kept track of how many busy signals and unanticipated disconnects were experienced as well as the length of waiting time required to transmit once on-line. ETA

Project staff printed out the test messages as they were transmitted to check for message integrity.

RESULTS

Only four of the sites (SERRC, Ketchikan, Fairbanks, and Bristol Bay RRC) were able to participate in the test and, because of some local problems, they were not all able to transmit at the originally scheduled times. Of the 53 messages sent, 47 percent were 100 percent accurate. Three more messages (6 percent) were 99.6 percent accurate and two messages (4 percent) were 99.1 percent accurate. Overall message accuracy was 96.0 percent. Because of this high degree of message integrity, no further analyses were made to compare reliability by length of message to time of day or site location. The few less-than-perfect transmissions were caused by:

- Line Hits – While sending the message, there was noise on the telephone line which caused some garbage characters to be printed in the message.

- Batch On/Off – At times, the host computer told the sender's unit to stop sending because it, the host computer, was busy and could not receive any more for the moment. Because of the long distances involved, by the time this STOP character reached the micro, it had already sent some characters that the host could not handle. Thus, those characters were lost; the result was a message with a series of missing characters. (This was a particularly bothersome problem in the early days of synchronous satellites because the long distance travelled by the signal, approximately 45,000 miles one way, resulted in almost a half-second delay before the STOP character returned to the sender.)

As a result, error correction protocols were planned for installation to correct both faults.

A second set of results related to the number of retries necessary for EMS operators to transmit the test messages successfully. The measured parameters were:

- mean number of busy signals;
- unanticipated disconnects; and
- waiting time per test message experienced by the sites.

Analyses of variance were carried out to determine whether there were significant differences among those variables depending on whether:

- the message was long or short;
- it was sent in the morning or afternoon;

- it originated from Juneau (host site), a nodal city, or a non-node site.

The significant differences noted in the unanticipated disconnects as a function of length of message and origination site appeared to be caused by chance since the offending site in both instances was Juneau.

There were consistently more problems experienced during the morning hours than in the afternoon. Even ignoring the factor of unanticipated disconnects, both the other variables show a significant discrepancy as shown in Table II-1.

Table II - 1

MEAN NUMBER OF BUSY SIGNALS, UNANTICIPATED DISCONNECTS AND WAITING TIME PER TEST MESSAGE: BY TIME OF DAY MESSAGE WAS SENT

	Morning	Afternoon	F
Busy Signals	1.71	0.70	2.10 (p<.25)
Unanticipated Disconnects	1.33	0.03	5.22 (p<.05)
Waiting Time	93.94 sec.	59.07 sec.	1.88 (p<.25)

During May, 36 percent of all uses occurred between midnight and noon in the Pacific Time Zone (PTZ); 54 percent (the previous 36 percent plus 18 percent more) occurred between midnight and noon in the Alaska Time Zone (ATZ) (displaced two hours earlier than PTZ); and 62 percent (the previous 54 percent plus 8 percent more) occurred between midnight and noon in the Bering Time Zone (displaced three hours earlier than PTZ). Although most readers do not have to contend with four time zones, as Alaska does, it is important that, initially, traffic loading as a function of time of day be recorded and analyzed. If periods of heavy traffic persist, the Postmaster, or equivalent, should attempt to convince operators to take advantage of the lessened problems encountered by using the slack time periods. In the Alaska instance, and as a possible solution for others who may consistently encounter this problem, the Division of Data Processing added additional ports to the host computer, thus allowing more users to connect simultaneously. Another recommendation is that all procedures for operation be reviewed to ensure that none of them is contributing to the problem.

An interesting but perplexing phenomenon was detected, i.e., a very significant difference was noted in both busy signals and waiting time between the two nodal cities, Fairbanks and Ketchikan. Upon further analysis, it was noted that Fairbanks performed its tests on May 3-4, while Ketchikan performed its tests on May 16-17. The latter period was during the first ten days that an upgraded version of the software was being used and, according to the Postmaster, was a time of numerous trouble calls. It was concluded that the differences were due to the dates when the messages were sent, rather than to any site-specific reason.

THE POSTMASTER'S TROUBLESHOOTING LOG

PURPOSE

The three purposes of this component were to identify problems related to:

- technical quality of the System;
- adequacy of training for users; and
- how the performance of each agency involved affected the System.

PROCEDURE

A log was maintained by each EMS operator on which were recorded all problems reported by those users working through that operator. The logs were collected by the Postmaster after the data collection period.

RESULTS

A total of 136 problems was noted on the Postmaster's compiled log. To see if there were differences in problems based on locations of the EMS sites, the log was analyzed separately for problems from node sites and non-node sites. The results can be noted in Tables II-2, II-3, and II-4.

Table II - 2

WAYS IN WHICH EMS PROBLEMS WERE REPORTED

	Node Site	Non-Node Site
By EMS	22%	23%
By Telephone	78%	77%

As can be noted in Table II-2, most of the problems were reported by telephone from both node and non-node sites while Table II-3 shows a clear difference between node and non-node sites for problems associated with the software and the communications lines.

Table II - 3

TYPE OF PROBLEM

	Node Site	Non-Node Site
Hardware	14%	15%
Software	62%	34%
Communication Lines	14%	43%
Operator Error	11%	7%

Table II - 4

HOW PROBLEM WAS RESOLVED

	Node Site	Non-Node Site
By Postmaster	15%	37%
By NWREL (D & I Contractor)	38%	2%
By Other Agency	12%	32%
Not Solved	35%	29%

The software problems encountered were related mostly to the user's mailbox being left in the active state. In this state, the user was not able to access the box and was notified that it was busy. This problem occurred whenever the user became disconnected from the host computer or experienced a software error which discontinued

EMS processing and automatically took the user out of the EMS program. The software error reported, which led to a box left active, occurred most often when multiple users tried to access the same data file at the same time. When this happened, the result was either an immediate error which took them out of the program or a "waiting" message. In some instances, the program was not able to access the file so the "waiting" message continued to print. In this case, the user had no choice but to hang up the phone and disconnect, thereby leaving the box active. This problem was resolved by a revision of software.

The software errors which did not involve multi-user access were much less frequent and accounted for only eight of the 45 software errors.

The communication line problems were relatively minor for node sites, but represented almost half the problems at non-node sites. This fact alone was important in identifying where problems lay. Node sites (nodal cities) were part of the backbone network of specially tailored circuits called "conditioned lines." The non-node sites had to contend with their local circuits (circuits provided within the community, many by a local carrier) as well as an additional circuit to tie the community to the node site. It was obvious that local circuits and those connecting to the nodal cities were the major culprits. Special attention must be paid to rural line connections, particularly where local telephone companies are concerned.

The small number of operator errors shown in Table II-3 was a good indicator that operator training had been adequate.

Problem Resolution, Table II-4, shows some interesting features. It should be noted that most non-node site problems were resolved by the Postmaster, whereas most node site problems were resolved by the D & I Contractor. To a large extent, this could be explained by the fact that many of the node site problems were also the Postmaster's problems since this position resided in Juneau, a node site. Therefore, these problems could not be resolved there. However, the Postmaster could resolve many problems affecting non-node sites since they usually did not simultaneously affect node sites. Other agencies were called in when the problems could not be corrected by the Postmaster or the D & I Contractor.

THE USERS' QUESTIONNAIRE

PURPOSE

There were six purposes to the evaluation activity included in this component:

- to determine whether users accepted the EMS;
- to determine whether EMS met the needs of users;

- to determine whether the System aided in the communicating and reporting of information;
- to identify problems related to adequacy of training of users;
- to compare the EMS, telephone, and postal service as a means of communication; and
- to determine the volume of messages transmitted via EMS by type and source.

It should be noted that the fifth item above is a major part of another component discussed later in this report.

PROCEDURES

Two questionnaires, one for *originators* of messages sent via EMS and one for EMS *operators*, were used. The operators were requested to reproduce enough message originator questionnaires so that one could be given to the persons at the site who most often sent messages via EMS.

RESULTS

Of the questionnaires returned, 36 were from message originators and 26 from operators. Since the linkage connection of the EMS micros to the host differed, depending on whether the user was located at a node site or at a non-node site, the results were tabulated separately for respondents from each type of site.

Of the message originators who responded from node sites, seven were from schools and six were from RRCs. From the non-node sites, eighteen were from schools, three from RRCs, and two did not indicate their locations.

To determine whether users accepted the EMS, originators of messages and operators were asked several questions. The originators were asked *when they last used the EMS to send messages.* Table II-5 shows the response received. The pattern of usage was quite different for message originators at node and non-node sites. However, 54 percent of node sites and 43 percent of non-node site originators had used the EMS within the previous two days; 62 percent from node sites and 82 percent from non-node sites had used the System within the past week; and 92 percent of node site and 95 percent of non-node site originators indicated EMS use within the prior two weeks. When asked about *reasons for not using the EMS*, 85 percent from node sites and 61 percent from non-node sites did list conditions for non-use. The reasons rated highest were : (1) when an immediate response was desired; (2) loss of personal conversational exchange; and (3) perceived loss of privacy when using the microcomputer.

Table II - 5

WHEN DID YOU LAST USE EMS TO SEND ANY KIND OF MESSAGE, REPORT OR SO FORTH?

Used It	(N = 13) Node Site	(N = 23) Non-Node Site
Today	46%	17%
Yesterday	8%	26%
This Week	8%	39%
Within Past Two Weeks	30%	13%
Within Past Month	8%	0%
Over a Month Ago	0%	4%
Haven't Used It	0%	0%

When the originators were asked to *compare intended use of the EMS in the following six months to its present use*, 85 percent of respondents from node sites and 61 percent from non-node sites indicated that there would be more use of the EMS in that time period. The use would be about the same as now, according to 15 percent of the originators from node sites and 30 percent from non-node sites. When asked *if more messages were written now than before EMS*, 33 percent overall indicated that there were more messages written now; 47 percent indicated the amount to be about the same; and 14 percent responded that it was too early to tell.

Of the operators who responded, 85 percent indicated that enough messages were sent so that it was not necessary to review the procedures before each use. When operators were asked the *extent to which busy signals were a problem*, 50 percent of the operators from non-node sites and 66 percent from node sites said it was *not* a problem. The remaining 50 percent of operators from non-node sites and 34 percent from node sites indicated that the extent of the problem was either moderate (25 percent and 16 percent, respectively) or slight (25 percent and 16 percent, respectively).

Unanticipated disconnects were considered more of a problem. The extent of the problem was great for 15 percent of the operators from non-node sites. This is consistent with results obtained relative to this area in the Exploratory Test. The problem was moderate for 17 percent of the operators from node sites and 25 percent from non-node sites. It was considered a slight problem to 33 percent of the operators from node sites and 35 percent from non-node sites, while 50 percent from node sites and 25 percent from non-node sites indicated it was not a problem at all.

Another important concern was *whether the EMS met the needs of the users*. Originators estimated that an average of 35 percent of their routine business communication could be handled by the EMS. Most originators (89 percent) indicated that instead of using the System themselves, operators usually used it for them.

Interesting results were obtained when *originators were asked if they felt guilty about not using the System* and *operators were asked if they thought that people who did not use the System possibly had guilt feelings* (Table II-6). Neither originators at node sites nor those at non-node sites felt guilt, yet 33 percent of the responding operators at node sites felt there were some guilt feelings. There was good consistency between the responses of originators and operators at non-node sites, however.

Table II - 6

Do you feel guilty if you do not use the system? (Orginator Questionnaire)

Do you think the people in your district who know about EMS feel guilty if they do not use the system? (Operator Questionnaire)

Response	ORIGINATORS (N = 13) Node	(N = 23) Non-Node	Response	OPERATORS (N = 6) Node	(N = 20) Non-Node
Yes	0%	0%	Yes	33%	0%
Sometimes	15%	0%			
No	77%	78%	No	17%	80%
Too Early to Tell	0%	17%	Don't Know	33%	20%
No Response	8%	4%	No Response	17%	0%

When asked if *they felt they should write more messages because there was an EMS terminal available*, 74 percent of the originators from non-node sites and 46 percent from node sites responded in the negative. There were 31 percent from node sites and 4 percent from non-node sites who responded that sometimes this was the case. Additionally, 15 percent of the originators from node sites and 4 percent from non-node sites felt that they should write more messages, while 25 percent from non-node sites indicated that it was too early to tell.

Originators from the node sites indicated that the *EMS allowed for sending or receiving information faster than mail* (92 percent) but only 8 percent indicated that the EMS was faster than both mail and telephone. Seventy percent of the originators from non-node sites indicated that the EMS was faster than mail; 17 percent indicated it was faster than both mail and telephone.

Both originators and operators were asked if *any improvements were needed to make the EMS better suited to individual needs*. Twenty-one percent of the suggestions received from originators indicated a need to tie the System directly to the schools where principals and teachers were located. Twenty-five percent of the comments suggested that the System be expanded to include links to others such as other State agencies and locations throughout the State frequently contacted by the schools. A need to increase education and training concerning the EMS also accounted for 25 percent of the suggestions made by originators.

Of the operators, 62 percent recommended expansion that would include more connections or links to other agencies, additional software programs, and variations of existing programs. Examples of such variations were the ability to underline words, to create lists with more than ten addresses, and to expand the list to include "TO:;" "ATTN:;" and "SUBJ:". Another suggestion frequently made (23 percent) was to decrease the response time of the micro to the operator's command.

From these results, it was concluded that the EMS was meeting some of the needs of the users. Although the originators estimated that approximately a third of their business communications could be handled by the EMS, they did not indicate that the System should be used more.

To determine *if the System aided in the communicating and reporting of information*, the originators were asked if the ability to communicate or receive communications more promptly through the EMS was an advantage in day-to-day operations. Eighty-five percent of the respondents from node sites and 74 percent from non-node sites indicated that there was such an advantage in many or most things.

In terms of a decrease in the depth of the in-basket containing unanswered communications since the EMS was installed, 57 percent of originators from non-node sites and 38 percent from node sites answered, "No, there was no decrease." However, 38 percent from node sites and 35 percent from non-node sites indicated that they did not notice. Only 8 percent of the originators from node sites and 4 percent from non-node sites responded that they did notice a decrease in the number of unanswered communications.

Originators from node sites estimated *that less time was spent preparing communications with EMS* (77 percent), while originators from non-node sites felt that either less time was spent (48 percent) or approximately the same amount of time was spent (43 percent) in preparing written communications, compared with the amount of time spent before the EMS was installed.

When asked if *they received more information of value now than previously,* 44 percent of originators responded affirmatively, but 42 percent also indicated that there was more busy work and unimportant information being transmitted via the EMS. When operators were asked this same question, 50 percent from node sites and 35 percent from non-node sites indicated that there was more information of value now. From non-node sites, 40 percent of operators felt that there was also more busy work and unimportant information being transmitted.

When asked *if reports or report-type data requests were answered more easily with the EMS,* 62 percent of originators from node sites and 48 percent from non-node sites indicated that they didn't know yet because they had not used the System for that type of data. Of those that had, an average of 28 percent indicated that reports were answered more easily with the EMS. Operators were also asked if requests for report-type data were answered more easily. Of those responding, an average of 50 percent indicated that they didn't know yet; they had not used the System for report-type data. Of those who had, 35 percent indicated that report-type data requests were answered more easily with the EMS. In response to the question of whether it was more difficult, none of the originators at non-node sites felt it was more difficult.

Sixty-two percent of the originators from node sites and 65 percent from non-node sites felt that they *were more in touch with other parts of the State now than before the EMS*. There were 30 percent from node sites and 26 percent from non-node sites who responded that it was too early to tell. When operators were asked a similar question regarding the people in their district, 50 percent from node sites and 65 percent from non-node sites indicated that, "yes," they thought district staff felt more in touch with other parts of the State as a result of having the EMS (Table II-7).

More of the originators from node sites indicated that they *would miss the EMS* if it was removed than did originators from non-node sites (69 percent vs. 48 percent). However, 30 percent of the

SOUTH EAST
REGIONAL RESOURCE CENTER
GIFTED-TALENTE
WORKSHOP
Anchorage
date: May 7 & 8
time 9am-5pm
place: SCRRC

Table II - 7

Do you feel more in touch with the other parts of the state now than before the EMS? (Orginator Questionnaire)

Do you think the people in your district who know about EMS feel more in touch with other parts of the state as a result of having EMS? (Operator Questionnaire)

	ORGINATOR		OPERATOR	
	(N = 13)	(N = 23)	(N = 6)	(N = 20)
	Node	Non-Node	Node	Non-Node
Yes	62%	65%	50%	65%
No	8%	9%	17%	5%
Don't Know			33%	5%
Too Early to Tell	30%	26%		

originators from non-node sites and 23 percent from node sites indicated that it was too early to tell.

When asked to *indicate which EMS features were liked best*, originators from both node and non-node sites rated as high the following features of the System: speed of communication; time to reflect on messages before responding; and ease of use. The fact that messages were sent more reliably than by mail or telephone also received a high rating from non-node site originators. When asked *what features were liked least*, originators from both types of sites noted the fact that communications were not private (at least in their perception). Originators from non-node sites indicated that the System was down too often. Originators from node sites disliked the small number of microcomputers and the difficulty in sending messages directly to teachers and principals.

Operators were also asked to indicate *which features of the EMS they liked best*. In responding to that question, operators rated "high" the speed of communication and the ease of use. Operators from node sites also liked the feature of message reliability as compared to that of mail or telephone. Informality of the EMS was cited by non-node operators as also desirable. When asked to rate the *features they liked least*, the operators indicated that the system was down too often and connections were hard to make.

When operators were asked *if the EMS took more or less preparation time than regular typewritten letters*, 83 percent from node sites and 50 percent from non-node sites indicated that the EMS took less time. There were 35 percent from non-node sites and 17 percent from node sites who felt it took about the same amount of time, and 15 percent from non-node sites indicated that the EMS took more preparation time than typewritten letters.

In summary, in terms of the EMS aiding in the communicating and reporting of information, the results indicated that the EMS was decidedly advantageous.

The operators were asked a number of questions *to determine the adequacy of their training*. The number of hours of instruction received by the operators did not differ markedly between node and non-node sites. Forty-two percent of the operators indicated that they received between 8-12 hours of instruction and 38 percent indicated that they received less than 8 hours. Twelve percent received from 13-16 hours. When asked if the amount of supervised EMS practice was adequate, 69 percent of all operators felt that the amount of supervised practice was adequate. Quite a bit more practice (2-4 hours) was needed by 15 percent of the respondents and a little more practice (less than 2 hours) was needed by 12 percent of the operators who responded. Most of the operators (96 percent) stated that within the first week after training, they had used the EMS. Most operators (100 percent in node sites, 68 percent in non-node sites) indicated that it took fewer than 10 uses before they felt comfortable using the EMS procedures. For the operators in non-node sites, 21 percent needed 10-20 uses and 5 percent required more than 20 uses before they felt comfortable. When asked to offer suggestions on training new EMS users, the operators recommended more supervised practice and more follow-up from the trainer after the initial session.

The results to the question, *"Who were the most frequent users of the EMS and what kinds of messages were sent?"* are shown in Table II-8. As can be seen, in non-node areas the superintendent accounted for only .7 percent of the messages sent. In node sites, the most frequent users were program directors and program coordinators.

Table II - 8

List the type of people who sent messages during the past week.
How many messages did each send?

Type	(N = 6) Node		(N = 20) Non-Node	
	N	%	N	%
Superintendent	1	.7	33	32
Assistant Superintendent	2	1	10	10
Other Central Office Staff	16	12	20	19
Principals	0	0	12	12
Teachers	0	0	4	4
Counselors/Psychologists	10	7	2	2
Program Directors	34	25	12	12
Program Coordinators	36	27	3	3
Instructional Materials Staff	19	14	7	7
Other (Linkers, Visitors, Comm. College Dean)	16	12	0	0

Table II - 9

How many messages of the following type were sent in the past week?

	(N = 6) Node		(N = 20) Non-Node	
	N	%	N	%
Letter: How Many?	42	33%	55	33%
Announcement: How Many?	25	19%	9	5%
Request for Information: How Many?	32	25%	40	24%
Response to Request for Information: How Many?	25	19%	32	19%
DOE or Other Government Form: How Many?	3	2%	20	12%
Other: What? How many?	2	2%	2	1%

In response to the query about *the number and types of messages sent*, letters and requests for information represented the most frequent uses in both node and non-node sites, with responses to requests for information close behind. Announcements represented 19 percent of the messages from node sites, while they constituted only 5 percent from non-node sites. The difference was probably caused by the fact that the Postmaster resided in Juneau (Table II-9).

EMS COST DATA

PURPOSE

The purpose of this component was to determine the costs associated with the EMS.

PROCEDURES

The Director and Assistant Director of the ETA Project and the NWREL Team Leader were asked to provide cost figures under the categories of System costs, training costs, and users' costs. These are shown in Table II-10. No auditing of financial records was performed. The costs of the EMS components, communication network, and training could not be estimated accurately because some of these costs were paid monthly, some were one-time expenditures, and some were to be paid over a period of five years. However, a rough estimate of the cost was arrived at for the EMS. This cost has been borne by the ETA Project through NIE and State funds. Monthly cost per local site, when operational, was also estimated.

Costs associated with site phone equipment and experimental operation are listed in Table II-11. Installation of school district hardware required modification of the site phones. This modification consisted of installation of a data-transmission phone. Dedicated line and monthly line charges were paid by the local school district. In addition, local clerical support and long-distance telephone-connect tariffs were also borne by local school districts. The estimates presented here were taken from a 1978 internal DOE document.

COMPARISON OF TELEPHONE, THE EMS, AND POSTAL SERVICE

PURPOSE

To compare the delivery rate and degree of reliability of messages sent by the EMS, telephone, and postal service.

PROCEDURES

Fifteen sites (five each from urban, rural, and remote rural areas) were selected to receive three pre-determined messages via the EMS, telephone, and postal service. Thus, each site was to receive nine separate messages. The messages were sent from DOE and responses from the sites were to be sent back to DOE. Notes were to be made on the messages by both DOE and site staff, indicating date and

Table II - 10

EMS COST DATA

COMPONENT	ALASKA One-Time Cost	ALASKA Monthly Cost	ALASKA Amortized Five Years	ETA One-Time Cost	LOCAL SITE Monthly Cost
SYSTEM-RELATED					
—Line Lease		$2,750			
—Equipment for Line Lease			$ 45,200		
—Engineering and Software Already Developed	$17,500			$ 93,670	
—Software to be Developed (est)	5,000			5,000	
—Host Computer Purchase			105,000		
—Host Computer Maint		1,000			
—Terminals Purchased			860,000		
—Terminal Maintenance (beg. in 1981)		350			
—System Operation and Maintenance	3,000	2,000		117,265	
USER TRAINING-RELATED					
—Training Package Development				44,280	
—Trainers' Time and Travel				28,110	
LOCAL SITES OPERATION					
—Telephone Charges (est)					$ 45
—Operator Time					80
	$25,500	$ 6,100	$1,010,200	$288,325	$ 125

Table II - 11

SITE TELEPHONE COSTS

ITEM	COSTS
Line Installation ($62.08 x 51 sites)	$ 3,166.08
Dedicated Line Monthly Tariff ($18.09 x 7 months x 51 sites)	6,458.13
Long Distance Charge ($1.08/3 mins x 2 transmissions per day x 120 days x 51 sites)	13,219.20
Local Clerical Support (1/2 hr/day @ $6.25/hr x 120 days x 51 sites)	19,125.00
TOTAL LOCAL SHARE — FY—79:	$41,968.41

time each message was received at the site by the district superintendent and back at DOE.

RESULTS

This component failed to accomplish its purpose because of misunderstanding by the involved personnel.

RECOMMENDATIONS

Although the formative evaluation lasted only two months and considering the fact that the users were new to the System and that all "bugs" had not been worked out, there were a number of important lessons learned which should be taken into account by readers involved with and/or contemplating installation of an EMS.

CONDUCTING BUSINESS

- Place EMS micros, wherever possible, on user premises, thus improving access. Having the unit on-premises could enhance users' feeling of privacy.
- Give users a voice in recommending new clients.
- Build commonly used report formats into the system to make it more attractive and useful to users.

MESSAGE EFFICIENCY

- Especially during initial stages, monitor messge traffic to determine peak periods. Notify users of off-peak hours to smooth traffic problems and probably reduce busy signals.
- Combine word-processing features with the EMS.

COST EFFICIENCIES

- Encourage imaginative use of site hardware by users. The more the System is used, the more cost-effective it becomes and the higher its perceived value.
- Pursue an aggressive information dissemination effort to encourage users to join the System.

TRAINING

- Provide follow-up training for operators after the initial training period.
- Operator practice on microcomputers should not be shortchanged during the training session.

PROBLEMS

- Use as a measure of Network performance, busy signals, unanticipated disconnects, and waiting time required to transmit once the user is on-line.
- Closely monitor communication lines, especially where small local telephone companies are involved.
- Use the Postmaster's Log as a means to identify software as well as hardware problems.

SELLING THE SYSTEM

The following positive features can be extolled:

- ability to send a message to many users simultaneously;
- speed of communication;
- EMS gives the user time to reflect on a message before responding;
- printouts give the EMS the virtue of written communication at the speed of electronic communication;
- rural users feel more in touch with their communities of interest;
- the EMS decreases time spent in preparing correspondence.

In preparing to sell the EMS, the following negative features must be recognized and dealt with:

- the EMS will probably not decrease the in-basket load of mail to be answered;
- the ability to easily send multiple messages will probably result in an increase in receipt of unimportant mail;
- some new users will feel a loss of the personal touch;
- some users will feel guilty about not using the System when it is available.

Try to encourage users in the innovative use of terminals by providing small grants for the purchase of compatible software.

FURTHER STEPS TOWARD INSTITUTIONALIZATION

From the very beginning, institutionalization by the end of Calendar Year 1981 was an objective of the ETA Project. Thus, each year, as more users became familiar with the EMS and learned through experience its advantages to them, a greater portion of the burden of the System support was transferred to them as well as operational agencies of the State. By the end of CY-1979, the following additional steps were taken:

USERS

- The EMS operators assumed some training chores and trained others to assist or replace them.

- School districts were encouraged, and in some instances assisted, in the use of their on-site micros for activities important to the management of their local business. As a result, the following are some of the uses to which the micros were put:
  - student training in vocational education;
  - collection of student work timesheets;
  - bookkeeping;
  - Title I program evaluation;
  - tracking special-education students.
- An upgraded "Statement of Understanding" between the user and ETA was introduced. The document stated, in part, that the equipment was procured by the ETA Project through a 24-month lease/purchase agreement and that local school districts had the option to purchase the equipment at the end of the 24-month period for a nominal transfer of title fee. A copy of the Statement of Understanding is included in Appendix D.

AGENCIES

The working arrangements with the Divisions of Data Processing and Communications were formalized in a Memorandum of Understanding (Appendix E) between their parent organizations and the DOE. In part, the Memorandum specifically spelled out the types and levels of support to be provided and the equipment for which each was responsible. The document also stated that "because of the requirement to interconnect the data processing equipment and the communication equipment,...the development of standards and the selection of specific equipment will be a shared responsibilty...It is understood that the responsibility for the success of the Project (ETA) is shared between the Division of Data Processing and the Department of Education and that the model for joint decision-making described in Attachment C will be in effect."

NEW USERS

The chances of institutionalization are greatly enhanced by the addition to the Network of new users who recognize its value to them. The following new organizational users were added in 1979:

- Seward Skill Center;
- Center for Cross Cultural Studies in Fairbanks;
- Sheldon Jackson College (private institution) in Sitka;
- Vocational Rehabilitation Offices in Juneau, Anchorage, and Fairbanks;
- Alaska State Film Library.

BUILDING STATE AND LOCAL SUPPORT

The Tenth Alaska State Legislature appropriated $450,000 for FY-79 activities with an on-going commitment to the four-and-one-half year life of the Project. The State Board of Education in a policy statement supported "the Department of Education's efforts toward the establishment of an alternative system of education program delivery based upon a cost-effective system of telecommunications and educational technology." Local education agencies provided in-kind services and a portion of their appropriation of FY-79 State monies in the equivalent of at least 19 percent of the State allocation to the ETA Project.

School districts and RRCs involved in the experimental test of the EMS expressed strong support for the statewide Administrative Communications Network. School administrators endorsed the Network as being able to replace a majority of long-distance telephone conversations.

Local and regional educators voiced support for ETA on a number of occasions. At the SERRC Board of Directors' meeting, school administrators wanted to know the procedure for obtaining additional microcomputers in order to have a unit in each principal's office. School administrators at the WRRC Board of Directors' meeting wanted to set up a regional school finance program, instructional materials center, and pupil personnel support talent bank on the EMS. At the Alaska Association of School Administrators' annual conference, the ETA presentation drew the largest number of participants of any of the conference sectionals. ETA presentations at the annual meeting of the Alaska State School Board's conference in Fairbanks resulted in several Board members volunteering their districts as sites for ETA pilot tests and their members to serve on curriculum advisory boards.

THE OPERATIONAL ELECTRONIC MAIL SYSTEM

For all intents and purposes, the EMS commenced operational service after the minor system "tweeking" that followed the evaluation of April-May, 1979. For ten months thereafter, performance was closely monitored to ensure that nothing had been overlooked previously.

TECHNICAL COMPONENT

LOCAL SITE

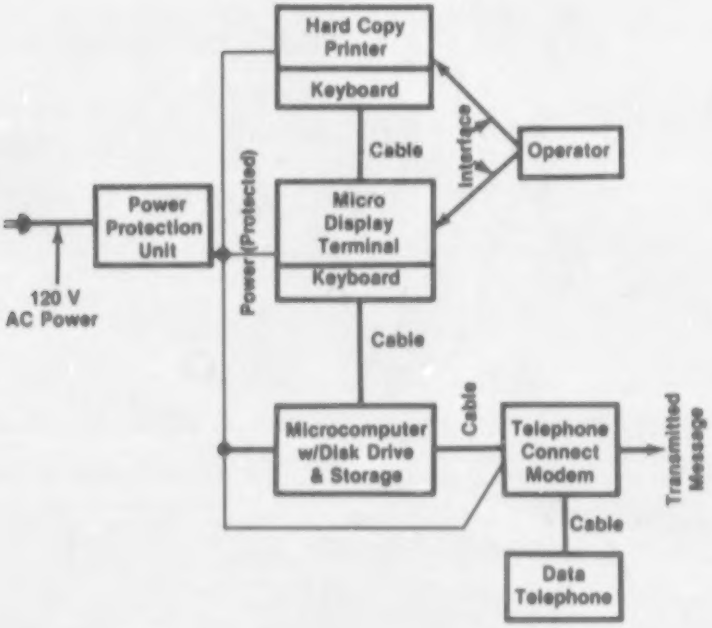
The operational local site configuration is shown in Figure II-9. The hardware consists of:

- *TOPAZ POWER FLUCTUATION UNIT* – This unit is the only unit that plugs directly into the wall socket. All other units connect to it in order to receive regulated power, i.e., power that is protected from variations from the primary source. Such power fluctuations can damage equipment.
- *BEEHIVE MICRO B-11 DISPLAY TERMINAL WITH KEYBOARD* – Instructions to the EMS are entered onto the keyboard of this unit. The display device is used to compose and receive messages from the Network.
- *GNAT COMPUTER SYSTEM 9 WITH DISK DRIVE AND STORAGE* – This is the heart of the site EMS. It is the microcomputer that follows instructions from the operator to compose, transmit, or receive messages. The instructions from the operator must be interpreted into computer language, however, and this is the purpose of the programs contained on the diskette (disk). In addition, the diskette serves as a storage place for information the operator puts there (e.g., for batch messages) or information sent to the operator from the mailbox contained in the PDP 11/70 host computer.
- *DATA TELEPHONE* – This is supplied by the telephone company. It is used to connect the microcomputer to the transmission network through the modem described as follows:
- *VADIC MODEL VA-3455 TELEPHONE CONNECT MODEM* – This unit provides the match with the host computer. The signals are re-formatted with error-correcting and other signals necessary to make the MICRO-B understood by the host and to ensure a minimum of mistakes caused by interference in the transmission media.

- *TELETYPE MODEL 43 HARD COPY PRINTER AND KEYBOARD* – This unit can be set by the operator to record on paper the messages that are originated or received at the local site.

Figure II - 9

SITE CONFIGURATION


Hard Copy Printer
Keyboard
Cable
Interface
Operator
Power Protection Unit
Power (Protected)
Micro Display Terminal
Keyboard
120 V AC Power
Cable
Microcomputer w/Disk Drive & Storage
Cable
Telephone Connect Modem
Transmitted Message
Cable
Data Telephone

COMMUNICATIONS NETWORK

The reliability of the backbone network and the high percentage of near error-free transmissions precluded any need for revision for the foreseeable future. The communication network is therefore identical to that discussed earlier under the Section entitled, "Operational Prototype Electronic Mail System" on Page 48.

TRAINING

The training evaluation conducted in early 1979 and reported in the Section entitled, "EMS Operator Training," on Page 54 identified few flaws in the training approach. The most significant change was that the Users' Manual constructed after that evaluation was used both in training and as the local site reference handbook for operators. This was looseleaf bound so that changes could be incorporated easily. It was entitled "From Here to There – A Step-by-Step Guide to Learning the Electronic Mail System." The Manual was written in great detail with both pictures and drawings to illustrate everything the operator needed to know, from how the local equipment was interconnected, through the operational use of the micro and associated hardware, to low-level troubleshooting procedures. Briefly, the contents were:

- Introduction - explained how to use the Manual
- Getting to Know the Terminal
  - Exercise 1 - How the Unit Connects
  - Exercise 2 - The Micro-B (terminal display and keyboard)
  - Exercise 3 - The GNAT and Diskette (microcomputer and storage)
  - Exercise 4 - The Teletype Printer (hard copier)
- Preparing to Call the Computer
  - Exercise 5 - The Data Phone (telephone)
  - Exercise 6 - Communicating with the Computer (local microcomputer)
  - Exercise 7 - Dialing In (dial-up procedure)
- Checking the Mail
  - Exercise 8 - How to Check Your Mailbox
- Using the Create Section
  - Exercise 9 - Creating and Sending Messages
- Recording Onto the Diskette
  - Exercise 10 - How to Use the Text Editor
- Preparing and Sending a Batch
  - Exercise 11 - Practice with a Sample Batch
  - Exercise 12 - How to Record and Send Batched Messages
- Problems and Questions – posed and answered questions related to problems that could occur at any step in the interface of the operator with the EMS.
- Sample Routines – annotated message printouts showed an actual copy of the computer "Prompts," explanatory notes of what the operator had to do in order to get the computer to print out the particular line shown in the message, and other helpful notes.

FINAL EVALUATION OF THE EMS

In June, 1980, the final evaluation report was prepared. By that time it was believed that there remained little more to be done before the EMS could be officially turned over to State operating agencies and the users. This last evaluation, therefore, was a final verfication of System performance and confirmation of the value of the Network to its users. The evaluation centered around 12 questions, some of which were duplicates of those forming the basis for the Exploratory Test evaluation (1979). This duplication was intentional. It was felt that, after almost a year, any novelty would have worn off and that the results obtained in this evaluation would represent the true worth of the EMS to its users. The questions were:

- What are the training needs of the operators?
- How can training needs best be met?
- Who makes the least and most use of the EMS?
- What is the nature of the messages sent?
- What is the frequency and length of on-line connections?
- What reasons exist for people using or not using the System?
- What are the problems?
- Who solves the problems?
- How does the EMS compare to other communication systems?
- What is the cost-effectiveness of the EMS?
- What is the feasibility of adding new users?
- Is there interest in other uses for the EMS equipment?

OPERATOR TRAINING NEEDS

(Questions 1 and 2)

The majority of school district sites reported some needs for further training. The needs fell into three categories: training other staff members; updating present skills/training in program change; and training in non-EMS uses of the computer. In addition, of the 35 school districts which responded, 21 indicated that they would pay to send a staff member for further training, nine indicated that they might pay, and five indicated that they would not pay for additional training.

Operational training needs could best be met by local operators training other staff members to act as their back-ups to reduce the chance that an office would be left without an EMS operator. To assist operators in training new individuals and to provide a self-instruction tool, a learning guide was written and distributed at the end of April, 1980. Updating of skills was provided through additions to the EMS Operator Handbook. Whenever changes occurred, the Postmaster announced the change via an EMS message and distributed up-dated Handbook pages for insertion in the loose-leaf binder.

MOST FREQUENT AND LEAST FREQUENT USES OF THE EMS

Sixty-five percent of the 86 responding users reported that they had used the EMS within the last week (44 percent reported using it during the last 24 hours, and 21 percent reported using it not more than one week previously). No one reported that their last use was over a month before, or that they had not used the System. Most users (90 percent) indicated that their planned use of the System was more or about the same in the future as it was presently. Table II-12 shows the percentage of messages sent by various users during a typical week. Sites are categorized by the nodal city dialed to enter the System. Superintendents and program directors accounted for the largest percentage of use. This represented a considerable increase in use by superintendents over the Exploratory Test a year earlier, indicating a greater appreciation of the System's value to them.

Table II - 12

PERCENT OF MESSAGES BY VARIOUS USERS REPORTED BY NODES FOR A TYPICAL WEEK

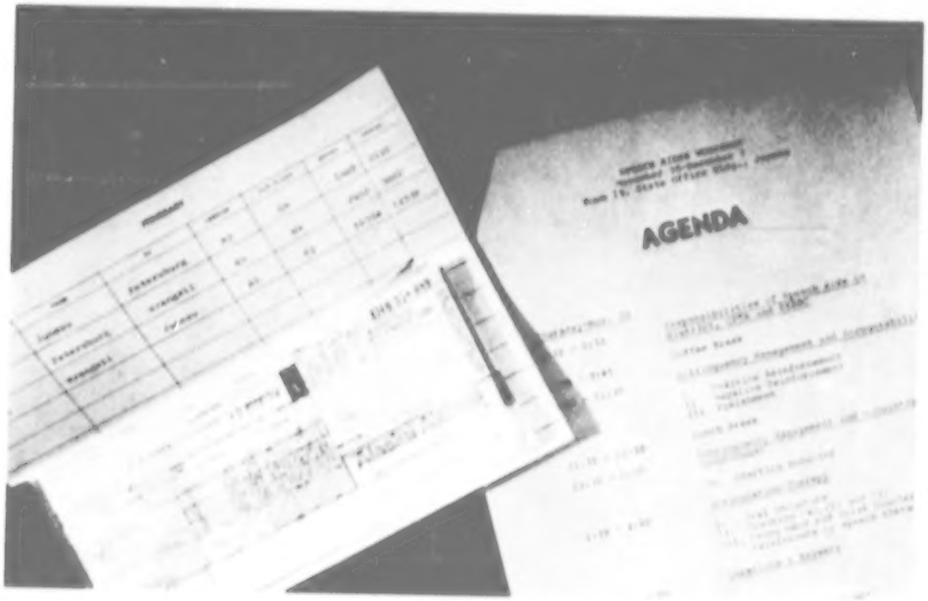
USER	ANCHORAGE	FAR NORTH	JUNEAU	KETCHIKAN	ACROSS ALL NODES
Superintendent	28	12	27	36	27
Asst. Supt.	2	10	2	7	4
Principal	2	10	2	7	4
Program Director	21	43	15	24	23
Spec. Ed. Director	—	—	—	18	2
Counselor	3	2	1	—	2
Teacher	1	4	10	9	5
Business/ Personnel Director	4	18	—	—	4
Professional Staff	6	2	34	—	13
RRC Director	9	—	—	—	4
Secretary	18	—	8	—	10
Supply Clerk	6	—	—	—	3

Respondents to the Agency Questionnaire (two Resource Centers, the University of Alaska-Fairbanks (Education), and six DOE divisions) indicated that project directors/coordinators utilized the System most, followed by special program consultants and librarians.

THE NATURE OF MESSAGES SENT

Nine responding agencies listed memoranda and regulations to school superintendents; scheduling of trips, meetings, and in-service training; and acquisition and exchange of information as the most common messages sent via the EMS. Unimportant messages received by the agencies were blanket information requests, blanket messages, and vacancy notices.

School sites specified that requests for information and responses to requests for information comprised the largest category of messages sent (approxiamtely 35 percent). General information, memos, and meeting notices (22 percent); communication with DOE (15 percent); personnel vacancies (11 percent); and surveys of districts on various topics (17 percent) comprised the great majority of the remainder of the messages. It was interesting to note, however, that four urgent messages were also sent during the week surveyed. This represents approximately 5 percent of all messages that week and may be an indication of the value placed on the EMS in terms of its speed and ability to get a message delivered.



FREQUENCY AND LENGTH OF ON-LINE CONNECTIONS

Available data could not delineate the exact nature of an on-line connection. Such a connection could mean that a box was being checked for messages and/or that messages were being sent. Therefore, the average length of time on-line could indicate the amount of time taken to send a message, to read a message, or both. On occasion, the phone connection could be terminated and the box remain open, thus increasing the apparent length of an on-line connection.

Table II-13 presents the mean number and percentage of on-line connections per month made at each node site from September, 1979, through April, 1980. As noted by the standard deviation, within node sites, there was wide variability in amount of on-line use. This indicates that some sites accounted for far greater use of the Electronic Mail System than did others. The phone costs for sites located at a long-distance phone charge from the node site (access node) may have affected the number of uses by these sites. An indicator of this can be noted in the tabulation in Table II-14 where those sites located within the local telephone area of the node sites represented a large portion relative to the remaining users of these nodes. The impact of long-distance calls on usage could not be finally determined at this time and had to await the results of the December, 1981 Survey. The pertinent facts are noted in the Section entitled, "Present and Future Desired Uses", Page 108.

Table II - 13

MEAN NUMBER AND PERCENT OF ON-LINE CONNECTIONS PER MONTH BY NODE

		1979				1980				Across Eight Months
		Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	
Anchorage (27 sites) +	N	543	553	550	435	567	537	521	649	544.38
	M	20.1	21.3	21.2	16.1	21.0	19.9	19.3	24.0	20.2
	SD	(20.9)	(11.1)	(9.3)	(9.8)	(12.3)	(11.2)	(10.3)	(13.1)	
	%	43%	36%	40%	41%	41%	42%	41%	44%	41%
Far North (12 sites)	N	300	351	342	300	268	261	274	350	300.5
	M	19.8	26.3	27.0	23.1	20.6	20.1	21.1	26.9	23.5
	SD	(18.7)	(27.2)	(20.3)	(16.5)	(10.6)	(13.2)	(14.4)	(18.5)	
	%	24%	23%	24%	28%	20%	20%	22%	24%	23%
Juneau (12 sites)	N	278	448	365	253	390	350	347	325	344.5
	M	23.2	37.3	30.4	21.1	32.5	29.2	28.9	27.1	28.7
	SD	(18.1)	(24.9)	(21.8)	(18.2)	(26.4)	(19.7)	(18.5)	(15.8)	
	%	22%	29%	26%	23%	28%	27%	28%	22%	26%
Ketchikan (6 sites)	N	139	172	140	90	145	135	115	152	136
	M	23.2	28.7	23.3	15.0	24.2	22.5	19.2	25.3	22.7
	SD	(16.1)	(23.9)	(17.9)	(9.8)	(19.5)	(19.1)	(16.6)	(26.2)	
	%	11%	11%	10%	8%	11%	11%	9%	10%	10%

N = Total monthly number of on-line connections for the node sites.
M = Mean number of on-line connections.
SD = Standard deviation.
% = Percent of all on-line connections for that month.
+ = There were only 26 Anchorage node sites from September through November.

Another factor that is assumed to have affected the number of on-line connections was access to the Postmaster. Juneau sites (not including the DOE) used the EMS, on the average, more than any other sites. The Postmaster encouraged use of the System and could be consulted by operators when they were in Juneau. Further, the amount and frequency of troubles an operator experienced impacted use of the System. Several of the outlying districts frequently reported telephone breakdowns. If the phone system is inoperable, the local EMS is inoperable. Maintenance problems with the hardware or software, although infrequent, were not so rapidly assessed or repaired in less accessible areas.

Attitudes toward the System and previous experience with it have been found to be closely related. The superintendents and operators who had had the most experience with the EMS were more enthusiastic about its usefulness and used it more often for originating messages.

Table II - 14

PERCENT OF TOTAL NODE USE ACCOUNTED FOR BY SITES LOCATED WITHIN THE LOCAL TELEPHONE AREA

	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Anchorage (27 sites)								
Anchorage Aleutian SCRRC WRRC Film Library								
Total	32	29	25	25	24	26	24	25
Fairbanks (13 sites)								
Fairbanks Univ. of Alaska, Fairbanks								
Total	35	43	36	33	29	33	32	32
Juneau (12 sites)								
Juneau SERRC								
Total	29	36	39	41	40	35	33	32
Ketchikan (6 sites)								
Ketchikan SE Island Annette Island								
Total	69	68	63	64	66	67	63	73

One of the goals for EMS operators was to reduce their time for a single use to below three minutes. This is because all long-distance charges accumulated for each additional minute beyond the first three, although any use which lasted less than three minutes was charged for a full three minutes. In order to exemplify the time required to transmit and receive messages, a time check by the Postmaster for a single EMS use demonstrated that three messages could be read in about 2.5 minutes and a 34-line pre-recorded batch could be transmitted in 1.5 minutes, for a total on-line time of four minutes. There were very few sites that showed an average on-line connection lasting three minutes or less. One-third of all the sites showed an average on-line time of three-to-four minutes and one-third showed average lengths between seven and ten minutes.

As stated previously, operators may send messages in two ways: on-line, interactively, or in the batch mode. No information was available to indicate whether batch processing or the interactive mode was utilized. Operator reports indicate that many of the more remote school districts were not using batch processing because, at this stage, they did not feel they had received sufficient training in that mode. It may be for this reason that the districts showing the longest on-line times (greater than ten minutes per on-line connection) were fairly remote ones. Table II-15 shows the average length of time per call of the more remote districts associated with three of the access nodes.

Table II - 15

AVERAGE LENGTH OF TIME PER ON-LINE CONNECTION FOR REMOTE SITES (ENTRIES ARE AVERAGE NUMBER OF MINUTES) FROM JANUARY-APRIL, 1980

SITES	AVERAGE LENGTH OF TIME
Anchorage Node	12.8
Fairbanks Node	16.3
Juneau Node	11.8

Table II-16 represents the relationship between the frequency of EMS on-line connections per month and the average length of on-line connections per month for all sites over the four-month period of January through April, 1980. For the most part, districts that used the EMS infrequently were on-line for a greater period of time. From the data, frequency of use is negatively correlated with length of time per use. This can best be seen by noting the last column, "Weighted Average," that clearly shows the relationship between more frequent use and average on-line time. To arrive at these figures, the number of messages in each column was multiplied by the largest number of minutes at the top of the column and divided by total number of messages sent.

Table II - 16

RATE OF USE AND LENGTH OF USE OVER ALL SITES (JANUARY, 1980 — APRIL, 1980)

Frequency of Use	Average Time (in minutes)							
	1-2	3-4	5-6	7-8	9-10	11-15	16 +	Weighted Average
Up to Once Per Week								
Up to Twice Per Week		1		1	2	2		10.3
Up to 3 Times Per Week	1		6	3	1	3		8.4
About Every Day	2	4	7	5	1	1	1	6.8
About 6-8 Times Per Week		2	3	2	1		1	7.6
Twice Per Day or More	1	3	2			1		5.9
Totals	4	10	18	11	5	7	2	

The incidence of EMS use as a function of time of day is an important statistic in the smooth running of any communication system; the EMS is no exception. Peaks and valleys in the number of calls can create a situation where at certain times users will receive an excessive number of busy signals. Time-of-day statistics allow the Network controller, or the Postmaster, to notify users of slack periods and thus spread traffic over the whole day. This will result in fewer fluctuations and more efficient use of the Network--postponing the time when additional host ports (at additional expense) must be added.

Usage patterns were recorded over two four-month periods. The frequency of EMS use was summed up for all sites each half hour over the months of September through December, 1979, and for January through April, 1980. During the first recording period, it was noted that the peaks occurred during the time periods around 8:00 a.m.; between 11:00 a.m. and noon; between 1:00 and 2:00 p.m; and 3:00 to 4:30 p.m. (referring to the PTZ). Recall that there are four time zones in Alaska. Phone rates become more expensive at 8:00 a.m.; hence, some sites try to get the bulk of their business communication completed by then.

A comparison of the time-of-day data between the two time periods studied indicated that operators decreased use during previous high-use periods (between 11:00 a.m. and 12:00 noon; 1:00 and 2:00 p.m.; and 2:30 and 3:30 p.m.) and increased use during lower use times (between 7:30 and 8:00 a.m.; and 8:30 and 11:00 a.m.). This indicates that notifying users of off-peak times had been effective. However, complaints about busy signals had increased since December. These busy signals were probably related to the overall increase in on-line connections between January and April. According to the frequency count during this time period, frequency of on-line connections increased from 7,557 connections to 8,858 connections--an increase of 1,201, or about 16 percent.

WHY PEOPLE USE OR DO NOT USE THE SYSTEM

Across all sites, 62-64 percent of the operators and originators reported that the EMS put them more in touch with the rest of the State while approximately 20 percent of both groups could not determine if it did, and 15-20 percent reported that it did not. In addition, 66 percent reported that they definitely would miss the EMS if it were removed.

When asked to suggest improvements, 41 percent of the 86 originators responded. The most frequently mentioned suggestions were:

- update the operator training;
- expand the number of operators;
- expand the Network to include contact with a wider variety of other agencies;
- use the GNAT for other purposes; and
- increase public awareness of the EMS.

Agencies rated the value of the EMS to their daily operations on a rating scale of 1 to 7, with 7 being the highest value. Of the nine responding agencies, 67 percent rated the EMS with a value of 5 or above. Twenty-two percent regarded the System to be of average value (4) to their agency and the remaining 11 percent rated the EMS with a value of 3. The fact that most agencies regarded the EMS as being of high value to their day-to-day operations was consistent with their listing of the most important types of messages for which they used the EMS (information, scheduling, and regulations and memoranda to superintendents).

Agency respondents indicated the characteristics of the EMS which they viewed positively or negatively. Table II-17 lists these features and the percentage of respondents who selected the feature. The data indicate that 78 percent of the agencies viewed *all* characteristics positively. It is understandable why privacy of the System presented no problem to most agencies when one notes the types of messages sent via the EMS. Only two agencies indicated that privacy of the EMS, System breakdown, and scope of agencies using the System were problems. Additional problem features of EMS for one agency were length of time to receive a reply, procedures necessary to use the System, and lack of sufficient training of operators.

Of the 35 school district sites responding, 16 sites (46 percent) viewed the EMS as valuable to their districts, primarily because of its efficiency, speed of communication, and enhancement of communication between districts. Thirteen school district sites (37 percent), that regarded the EMS of "average" value to their districts, stated that it was becoming more valuable and had greater potential than was then being utilized. Six of the sites (17 percent) viewed the EMS as having "little" or "dubious" value.

Table II - 17

PERCENT OF AGENCIES RESPONDING TO CHARACTERISTICS OF THE EMS POSITIVELY OR NEGATIVELY (N = 9)

Characteristics of EMS	Percent of Positive Response	Percent of Negative Response
Privacy of the System	78	22
Length of Time to Receive a Reply With EMS	88	12
System Breakdown	78	22
Procedures Necessary to Use the System	88	12
Terminal Location	100	0
Scope of Agencies/Units Relevant to my Agency Who Have the EMS	78	22
Training	NA	12

When the sites were classified with regard to the level at which they valued the EMS, several patterns of characteristics emerged. Those which placed a high value on the EMS used the System to replace other modes of communication (phone and letters) to a greater degree (a mean of 23 percent compared to 13 percent who indicated "average" value and 2 percent who voted "little" value). Also, in the "valuable" category, 81 percent of the sites were willing to pay for additional training costs as compared to 61 percent ("average") and 66 percent ("little") in the other two categories. The sites assigning "average" and "little" value to the EMS were primarily message responders as opposed to originators of messages.

Twelve node and remote (non-node) sites were interviewed to ascertain whether fundamental differences existed between those in very different environments. The majority (nine sites) viewed the EMS as valuable because of its efficiency, reliability, speed, and enhancement of communication. For 11 of the sites, the academic year's experience since the last formative evaluation showed the EMS to be less costly than the phone system as a communication mode. Three sites noted a low utilization rate because (1) phone and mail communication modes were satisfactory; (2) the EMS was used only if speed of communication was relevant, yet the message was not important enough for a phone call; and, (3) the operator had been unsuccessful in soliciting staff use.

All sites interviewed had experienced definite improvement in the EMS over the academic year with fewer equipment problems, expansion of uses for the micro, operator efficiency, and faster response time. The three most positive features indicated by the 12 sites were speed of communication, cost savings, and enhancement of communication. Seven of the sites reported they did not view the EMS as having any negative features. Two of the four sites that did list negative features stated that space needed for the equipment was a problem. The other negative features were long-distance charges for some of the users (two sites), equipment failure (one site), and some functions were not easy to use (one site).

PROBLEMS

Each operator maintained a log of problems experienced in 14 different areas pertaining to the EMS operation in the Fall Quarter (October through December, 1979) and in the Winter Quarter (January through March. 1980). These problems are shown in Table II-18 as well as their frequency of occurrence. Total number of problems decreased by 25 percent for the Winter Quarter. Four problem-related events accounted for this major decrease. "Disconnected at log-in" showed a decrease of 62 percent, "waiting encountered" decreased 69 percent, "box being used" decreased 62 percent, and "error requiring notification of Postmaster" decreased 44 percent. Three classes of events increased in actual number from Fall to Winter Quarter. "Disconnected after log-in" increased 106 percent; "busy signal" increased 38 percent; and "had to phone more distant node" increased 26 percent.

Ranked in order by the percentage of all the events which pertained to each problem for the total time period being discussed here, "disconnects at and after log-in" totalled 28 percent of the problems reported; "receiving no response from the computer when the carrier light was present" constituted 14 percent; "receiving a busy signal when dialing the computer" accounted for 11 percent; "slow response time" accounted for 9 percent; "had to phone a more distant node," represented 7 percent of the problems noted; and "error, notify Postmaster" and "waiting" accounted for 6 percent each. "Box being used" and "need for re-transmission" each represented 5 percent of the problems reported.

Operators in the Fall Quarter were queried about whether some of the faults were considered problems for the operators themselves. With regard to disconnects, 79 percent of the operators reported that this caused them "no" or "slight" problems; at least 85 percent were not bothered or slightly bothered by busy signals or problems that required equipment maintenance. Apparently, they did not perceive the occurrences as causing them serious difficulties – perhaps a reflection on the value of the System.

WHO SOLVED THE PROBLEMS?

A breakdown of the number of problems handled by the Postmaster and a number of agencies was recorded for two time

Table II - 18

OPERATOR TROUBLE LOG FREQUENCIES: FALL AND WINTER QUARTERS

Event	Frequencies	
	Fall Quarter (N = 33)	Winter Quarter (N = 33)
Disconnected at Log-In	141	53
Disconnected After Log-In	36	74
Busy Signal	52	72
No Computer Response When Carrier Light On	84	68
Batch File Data Not Returned After Batch Sent	14	9
Need to Re-Transmit Batch	34	22
Slow Response Time	53	43
"Waiting" Encountered	52	16
"Box Being Used" Encountered	39	15
"Error, Notify Postmaster" Encountered	41	24
Trouble Getting Video on Screen	5	0
Trouble Getting Hard Copy	13	6
Error, Required to Notify Postmaster	34	19
Had to Phone More Distant Node	34	43
	622	464

periods, July 24 through December 28, 1979, and January 3 through May 27, 1980. The number of problems referred decreased from 122 in the first period to 83 in the second, a decrease of 32 percent. The Postmaster handled more than half (52 percent) of the problems in the first period. This decreased to 37 percent in the second period. Transalaska handled most other problems during both time periods (21 percent in the first and 25 percent in the second). The problems handled by the State Division of Data Processing increased by 10 percent during the second period, from 12 percent to 22 percent. The Division of Communications handled the next largest number of problems (8 percent and 11 percent) and local telephone companies the least number (8 percent and 5 percent). Table II-19 presents a breakdown of problems these referrals included. The bulk of problems were with the telephone system or network, micro-associated (terminal hardware and software), EMS software, and operator error or training. There were substantial decreases during the second period related to the telephone company or network (31 to 19), EMS software (27 to 15), and operator error or training (37 to 12). Problems with the micro-associated units remained at approximately the same frequency.

Table II - 19

POSTMASTER PROBLEM SUMMARY FOR TWO PERIODS

Problem	First Period 7/24/79—12/28/79	Second Period 1/3/80—5/27/80
Telephone System/Network	31	19
Terminal Hardware	19	20
Terminal Software	4	5
EMS Software (Host Computer)	27	15
PDP 11/70	4	6
Operator Error/Training	37	12

HOW THE EMS COMPARED TO OTHER COMMUNICATION SYSTEMS

The nine reporting agencies indicated that the EMS was used most frequently for requesting as well as conveying information; mail and phone were used as second and third choices for these two communications needs. For both DOE and government-form communication, agencies tended to utilize the mail first, the EMS second, and phone third. For personal communications, the agencies reported using the EMS as their second choice, with mail preferred, and phone, the third choice.

The mean percentage of phone calls replaced by the EMS for the 31 reporting school district sites (local to district offices) was 17 percent (range of 0-65 percent). Four schools were unable to determine the percentage which the EMS replaced. The mean percentage of letters replaced by the EMS for the 32 reporting sites was 14 percent (same range, 0-65 percent); three schools were unable to determine the percentage which the EMS replaced.

Node sites were divided evenly on the advantages of the EMS when compared to mail and telephone service. Anchorage and Fairbanks viewed the System as more economical, faster, and reliable than mail or phone; Juneau and Ketchikan stated that they did not know.

Six of eight remote sites cited the EMS as less costly than phone and quicker than mail service. One site expressed no opinion and one site with the Anchorage node believed the phone to be less costly than the EMS.

EMS COST-EFFECTIVENESS

To determine the cost-effectiveness of the EMS, a number of variables was considered. Ideally, both monthly use and per-message costs should be calculated for the present as well as projected use. Per-message costs, however, could not be determined because the EMS usage data did not delineate message usage. The data available presented by month and site, the number of on-line connections made (could have included several messages during that period), the total on-line connection time in minutes, and the average on-line connection time in minutes.

The variables considered in the EMS cost analysis model included:

- network equipment maintenance charges;
- host computer operation cost;
- long-distance telephone toll fee;
- local telephone service charge;
- lease line fee;
- capital costs for hardware;
- Postmaster services/salary;
- operator salary;
- cost for training of operator; and
- costs of paper for printing messages.

Certain assumptions were made in creating the cost analysis model:

- *Lease Line Fee* – DOE paid this annual cost of $57,000. Future costs to the users eventually will depend on how many other groups share the lease line. Because of unknowns, this cost was omitted from the model.
- *Capital Costs* – Hardware and software costs were amortized by the DOE. Since no costs had been incurred by users (to date), this was omitted from the model.
- *Postmaster Salary* – Since this was also paid by the DOE, it too was omitted.
- *Operator Salary* – Operating the EMS microcomputer replaced time spent on other modes of communication rather than increasing staff time; therefore, this cost was excluded.
- *Training of Operators* – DOE provided training of original operators and provided the sites with an illustrated learning guide kit for assisting operators to train new staff. Therefore, this cost was excluded.
- *Cost of Paper* – Since the cost of this item was considered small, relative to other monthly charges, the cost was omitted from the model.

The model analyzed, therefore, contained the "network equipment maintenance cost," "host computer operation cost," "long-distance telephone toll fee," and "local telephone service charge."

- *Network Equipment Maintenance Cost* – Established by Alaska State Law, Section 14.17.051.
- *Host Computer Operation Costs* – Approximately $45,000 per year. Dividing this annual cost by 12 months and 58 sites (the number of user sites at the time) yielded a monthly cost of $64.66.
- *Long-Distance Telephone Toll Fee* – Monthly toll fee was calculated by obtaining each site's average on-line connection time from January to April, calculating the cost of the long-distance telephone connection for that length of time, and multiplying that cost by the monthly average number of on-line connections for the site.
- *Local Telephone Service Charge* – Typical monthly charge quoted by the Postmaster was $25.00.

Applying the model costs to 13 selected sites resulted in the figures shown in Table II-20. The variations are accounted for primarily by the differences in long-distance telephone toll charges as they relate to the average length of on-line connection which operators made. The average number of on-line connections made in a month also caused cost variations among EMS sites.

Table II - 20

COST ANALYSIS COMPARISONS

Sites	Present Cost Per Month	Future Cost Per Month
Anchorage Node		
Anchorage	$ 25.00	$ 245.40
Adak	138.90	421.60
Kodiak	142.00	387.32
Lake-Peninsula	73.81	379.87
SCRRC	25.00	245.40
Fairbanks Node		
Delta/Greely	62.40	313.95
North Slope	84.29	390.35
Yukon Flats	110.17	416.23
Juneau Node		
Chatham	48.36	281.22
Wrangell	69.55	296.18
DOE	37.50	368.10
Ketchikan Node		
Annette Island	25.00	251.63
Klawock	39.85	272.71

The projected future monthly EMS costs were necessarily higher than the present costs. It was assumed that, in the future, sites would be assessed fees for host computer usage and site equipment maintenance. (In actuality, the sites will not have to pay fees for the host computer because since it is being used for so many different purposes within the DOE, DOE has obligated itself to pay the charges.) Costs to EMS users could be further reduced in a number of ways which includes (but is not limited to) reducing the amount of on-line time and updating the System to provide a more rapid transmission rate, e.g., 1200 baud instead of the present 300 baud. This could reduce long-distance toll fees by as much as a factor of four.

In discussing the cost-effectiveness of the EMS, it was necessary to compare it to the more traditional communication methods – telephone and the U.S. Postal Service. When compared with phone and mail, convenience and efficiency were most often mentioned as advantages of the EMS by user sites. Five of the eight remote sites interviewed specifically stated that the EMS was less costly than the phone for satisfying their communication needs. One site located at the Anchorage node indicated that the EMS was more economical than both mail and phone service. Commonly, EMS users cited the EMS as faster and more reliable than the U.S. Postal Service, and less costly than personal long-distance telphone calls.

Note that the costs are per-site costs. A truer picture would have been gained were it possible to collect data on the per-message cost. Consider the effectiveness of the multiple-user address mode, i.e., a single message being simultaneously delivered to a number of recipients.

THE FEASIBILITY OF ADDING NEW USERS

A potential problem with adding new users to the System was overload of the lines. Consultation with the Postmaster, who periodically monitored the System, indicated that no overloading occurred. At no time during monitoring had more than three users been on-line at one time. Further, agencies recently added to the System did not report more or different problems than the earlier-connected agencies.

INTEREST IN OTHER USES FOR THE EMS MICRO

Some districts were already using the System for more than electronic mail; others were making plans to do so. The non-EMS computer uses which school districts reported for the present and future, in order of priority were: bookkeeping/record keeping; form/Title I reporting; accounting; student and student accounting and vocational education (equally frequent); Alaska Knowledge Base and personnel records (equally frequently); and filing systems.

RECOMMENDATIONS

At each step where new knowledge has been gained about effective and efficient use of the EMS, the reader has been alerted.

The following set of recommendations highlights the best ways to gather information useful to continually assess System cost effectiveness and to encourage System growth.

- *STATISTICAL DATA GATHERED BY COMPUTER*
  - retrieve data about the number of messages sent and received during on-line connections according to site;
  - obtain data about message length (in seconds) and the length of time during on-line connections in which messages are being processed;
  - obtain the most specific data available about the frequency of use of the EMS at each site;
  - obtain data about the frequency of batch processing versus interactive mode and single-address message versus multiple-address messages;
  - obtain data about which particular access node the EMS sites utilize.
- *COST REDUCTION AND EQUALIZATION*
  - increase the rate of transmission to allow more characters to be transmitted in a three-minute telephone call;
  - consider a "cost-sharing plan" in which agencies located at nodes are assessed part of the cost for messages sent by them to remote sites;
  - establish a box or information module for storage of general notices about meetings, position vacancies, and the like so that only sites desiring this information pay for it.
- *TRAINING AND GROWTH*
  - create a process for obtaining user input to determine policies regarding growth and changes to the EMS;
  - create a mechanism for disseminating information relative to non-EMS uses of site micros;
  - create a mechanism whereby interested users may gain training necessary to utilize non-EMS uses of their microcomputers.

VERIFICATION OF SUCCESSFUL COMPLETION OF THE EXPECTED RESULT

Early in 1978, at the beginning of the Project, a set of standards was developed that, if met, would signify successful accomplishment of the Network objective. For the Administrative Communications Network, that objective was formulated as the Expected Result, "A model administrative network among and between DOE, school district offices, RRCs, and some local schools supported by telecommunications, provides more efficient management by permitting timely input and greater communications and field participation."

Associated with it were nine Verifiable Indicators (set of standards) stated in explicit operational terms and dates of what was to be expected at key points in the Network's development. For all intents and purposes, the Administrative Communications Network was turned over to the users and operational agencies as of mid-1981. A comparison of the Verifiable Indicators (VI) and the evidence testifying to their accomplishment is presented:

- *VI-1:* "By 1980, 90 percent of the districts in the State will have ETA terminals and use them to communicate with other agencies at least every other day."

  EVIDENCE:

  - The decision was made early in the Project's life to install microcomputers in all 52 districts from the very beginning. In preparation for the Pilot Test (April-May, 1979), the Southeast District received its permanent micros and associated equipment. Mountain Village received their micro in October-November, 1980 and St. Paul (Pribilof Islands School District) received its micro in Spring, 1981, thus completing all planned installations.
  - By April,1979, 54 percent of the node sites and 43 percent of the non-node sites had used the EMS within the previous two days. Ninety-two percent of node and 95 percent of non-node sites had used the EMS within the prior two weeks. However, 85 percent of originators from node sites and 61 percent from non-node sites indicated there would be greater use of the EMS in the succeeding six months.

  The percentages do not present the entire story because each site services a number of users. By mid-1981, and even before, it is known that the average number of messages was running close to 2,000 per month – the equivalent of one message per day for each of the 71 user sites.

This VI was accomplished ahead of schedule.

- *VI-2:* "By 1980, at least two reports are electronically transmitted to the DOE from 50 percent of the local educational agencies;" and
- *VI-3:* "By 1981, four reports are electronically transmitted to DOE from 65 percent of the local educational agencies."

EVIDENCE:

During the Pilot Test it was confirmed that agencies, on their own, were using the microcomputer with forms for what they considered important activities that were continually required either on-site or by the DOE. Bookkeeping/record keeping was at the top of the list, primarily for local use. Although this is not what the VIs called for, Project management has continually pushed for non-EMS use of on-site equipment to further decrease the costs chargeable directly to the EMS and to build further the value of the technology in the minds of the users.

DOE acknowledged the demand for certain forms and in 1981 developed four in the areas of: Title I program evaluation; tracking of special education students; tracking student training in vocational education; and bookkeeping/record keeping (primarily for local use). Field testing was begun in a large number of school districts. If successful, the DOE will make the programs available at a nominal fee and provide training in their use.

These VIs will not be achieved until 1982.

- *VI-4*: "In 1981, 80 percent of the district administrators feel the Administrative Communications Network is valuable and are willing to expend local resources to ensure continuance."

EVIDENCE:

- Eighty-five percent of originator respondents from node sites and 74 percent from non-node sites during the Pilot Test evaluation indicated that there was an advantage to using the EMS in communicating and reporting information.
- By mid-1981, originators estimated that an average of 35 percent of their routine business communication could be handled by the EMS.
- For FY-79, local educational agencies provided in-kind services and part of their legislative appropriation the equivalent of at least 19 percent matching funds to those which the State provided for the ETA Project.
- In July, 1981, ETA Project management officially assigned the EMS equipment to all 52 school districts, via a transfer of title as part of the handover of system responsibility to the users. Along with the equipment, school districts accepted the responsibility for paying the cost of maintenance, telecommunications costs to access nodes, and the salaries of EMS operators.

This VI was, therefore, accomplished ahead of schedule.

- *VI-5*: "In 1981, communications and reporting of information will be substantially improved as attested to by the users."

  EVIDENCE:

  Ninety-two percent of the originators from node sites indicated that the EMS allowed for sending and receiving information faster than by mail and 8 percent said it was faster than both mail and telephone. Seventy percent of originators from non-node sites indicated that the EMS was faster than mail and 17 percent indicated it was faster than mail and telephone (Pilot Test Evaluation, April-May, 1979).

This VI was realized ahead of schedule.

- *VI-6*: "In 1982, at least 70 percent of the district administrators wish to continue reporting to the DOE via the EMS."

  EVIDENCE:

  - Eighty-five percent of orginator respondents from node and 74 percent from non-node sites indicated there was an advantage to using the EMS in communicating and reporting of information (April, 1979).
  - By mid-1981, approximately 2,000 messages per month were being sent by its complement of 71 user sites.

This VI was accomplished several years before the expected time.

- *VI-7*: "By 1982, the costs associated with the Administrative Communications Network are affordable and acceptable to 90 percent of the users."

  EVIDENCE:

  - In 1979, the mean percentage of phone calls replaced by the EMS for the 31 reporting school districts was 17 percent (range was from 0 - 65 percent). The mean percentage of letters replaced by the EMS was 14 percent (range was from 0 - 65 percent).
  - In July, 1981, all 52 school districts assumed responsibility for the EMS equipment via a transfer of title. They also are paying for operator salaries, maintenance, and for telephone charges.

This VI was met several years ahead of schedule.

- *VI- 8*: "By 1982, 70 percent of relevant communications needs are being met by the Administrative Communications Network."

  EVIDENCE:

  - Originators estimated that an average of 35 percent of their routine business communications could be handled by the EMS.

- In the 1979 Pilot Test Evaluation, 62 percent of originators from node sites and 65 percent from non-node sites felt they were more in touch with other parts of the State than before use of the EMS.

This VI has been successfully accomplished.

- *VI-9*: "In 1982, the technical quality of the System is adequate to support its defined uses."

EVIDENCE:

- Of 53 alphanumeric test messages sent during the Pilot Test, 47 (88 percent) were 100 percent error-free; three (6 percent) were 99.6 percent accurate, and two (4 percent) were 99.1 percent accurate. Because of the high degree of message integrity, no further analyses were performed.
- The main software problem in the 1978 Exploratory Test was due to users' mailboxes [illegible] left active after disconnect, thus precluding them from accessing the mailboxes again until the Postmaster cleared the situation. By Fall, 1980, this problem had decreased by 62 percent.
- All operators from node and non-node sites considered the problem of busy signals to be moderate, slight, or of no consequence in the Pilot Test evaluation. By Fall, 1980, this problem had decreased by 69 percent.
- In the 1979 Pilot Test evaluation, 15 percent of the operators from non-node sites considered unanticipated disconnects a problem. All remaining operators from both types of sites felt it was moderate, slight, or no problem at all. By Fall, 1980, the unanticipated disconnects had decreased by 62 percent.

This VI has, therefore, been met.

In summary, except for those associated with the electronic transmission of forms, all Verifiable Indicators were met or exceeded on time or in a shorter time frame than specified.

HANDING OVER THE EMS

With the successful accomplishment of its Expected Result, the way was clear to hand over the System to the users and operating agencies. Thus, on July 19, 1981, the ETA Project assigned the EMS equipment to the school districts by an official transfer of title. Along with this, school districts accepted responsibility for providing maintenance of the equipment. EMS operator training was to be handled by the South East Regional Resource Center under contract to DOE through June, 1982; local districts would assume total responsibility as of July 1, 1982. In addition, a number of DOE personnel were to be trained in order to provide assistance to the districts on a continuing basis.

The major transfer of responsibility was to DOE's Division of Management, Law and Finance (MLF) which established a new unit, the Information System Data Processing Unit, to manage and fund the contracts with the Divisions of Data Processing and Communications, beginning in FY-82 (July, 1981). Development and installation of additional software applications also became the responsibility of this new unit. MLF accepted responsibility for managing the PDP 11/70 host computer, software associated with site micro use (other than directly associated with the EMS), and assigning accounts on the host computer. In addition, EMS revisions, EMS file maintenance, mailbox assignment, troubleshooting, and usage policies also became MLF's responsibility in the operational system. With regard to the next generation of EMS microcomputers, MLF was charged with "upgrading terminal micro equipment to the state-of-the-art," thus ensuring that the EMS would continue to evolve and become ever more useful to the user community.

In line with DOE's policy to continually foster changes in the EMS that are useful to the districts, the Office of Planning and Research has developed three software packages that school districts can use with their local micros. They are presently being pilot-tested by schools in many different districts. Based on the results of this pilot test, these packages will be offered to all school districts, along with training. However, costs associated with the software and required hardware changes will be borne by the districts themselves. A description of these packages follows:

- *Title I* – Assists local administrators prepare Title I reports to meet State reporting requirements for funds, meet Federal reporting requirements and, most importantly, provide data for local evaluation. The computer produces two reports for district use: a document with student information and test scores and a report with a compilation of test scores. It also produces two reports for State reporting: General Form for Title I Participation and Achievement Information Report. Flexibility is also provided by the data base management software Query System. This permits teachers/administrators to manipulate the data to compile lists or produce reports of local interest other than those already programmed.
- *Staff Accounting* – Assists superintendents/administrators to keep in touch with staff data, e.g., name, social security number, salary, years of experience, racial information, academic degrees, etc. This information is quickly available for local use or for reports to DOE on staff accounting and may be updated periodically merely by sending in the update data via the EMS. This program is also equipped with the Query System to permit compilation of reports other than those programmed.
- *Vocational Education* – Assists Vocational Education directors and other administrators in preparing local, State, and Federal reports necessary for the program, e.g., number of students by race and sex, handicapped and disadvantaged condition, course

name and number, teacher, program code, etc. Also included are such Federal reporting requirements as Enrollment and Completion Reports and FTE Reports. The Query System is again available here for local report generation.

Thus, by establishing "institutionalization" as one of the key objectives of the ETA Project from its very beginning and by carefully nurturing the users, the communities, and support agencies, the total transition was successfully accomplished in three-and-one-half years. By mid-1981, approximately 2,000 EMS messages per month were being sent by its complement of 71 user sites. Teachers and administrators in rural and remote communities are no longer isolated from their colleagues, are no longer left out of the planning/fiscal cycles, are no longer in the dark about what is being done by the Legislature or DOE in Juneau that would impact their way of doing business--and most importantly, their voices are being heard.

HOUSE OF REPRESENTATIVES

EMS USER SURVEY

In December, 1981, five months after the Administrative Communications Network had been officially handed over to the users and the Division of Management, Law and Finance, a survey questionnaire was sent to the field to gather information "relevant to providing better service and to guide further growth direction of EMS services." It was known that interest in additional applications of the site equipment was growing and that the present GNAT computer was nearing the end of its useful life -- some had been in the field almost five years. A copy of the survey instrument is included in Appendix F. The findings are discussed here and where possible, compared with the findings of the June, 1980, evaluation results. The questionnaire is essentially divided into three parts: Present and Future Desired Uses of EMS; User Training and Support; and Maintenance.

Fifty-five responses were received from the field. Some were answered by more than a single individual. Thus, a total of 68 originators and operators are covered by the results. Of the 68, 43 represent message originators and 25, operators. Twenty responders were from nodal cities (Anchorage, Fairbanks, Juneau, and Ketchikan) and 48 were from non-nodal sites. Of the actual returned questionnaires, 20 were from access nodes and 35 were from non-nodal sites.

The length of time that responders have been EMS users showed that those at non-node sites joined the Network earlier and their numbers have remained relatively stable over the years. On the other hand, new agencies and institutions, not an early ETA target population, have more recently joined and continue to do so as they learn about the Network. The average non-node site has been on EMS for three-and-one-quarter years (range: from one to four-and-one-half years), the majority for three or more years. The average nodal city user has been on EMS for two-and-one-quarter years (range from three months to four years), more than half for two years or less.

PRESENT AND FUTURE DESIRED USES

Early in the implementation phase of the EMS, users were told that the communication charges from site to access node would be borne by site users. Earlier evaluations showed dominant use of the Network by those closest to access nodes, presumably because the long-distance charges were less. In response to questions relative to long-distance usage, the following information was returned:

- Of the 35 non-node sites, 33 identified the nodal cities they used predominantly: Anchorage (13); Fairbanks (6) Juneau (13); and Ketchikan (1).

- Thirty-four sites provided information relative to their monthly communication costs:

Costs	Sites
$10.00 to $19.99	4
$20.00 to $29.99	1
$30.00 to $39.99	5
$40.00 to $49.99	5
$50.00 or more	19

Of the 19 sites paying $50.00 or more per month, 15 provided approximate monthly bills. The charges ranged from $65 to $500 per month. The average monthly bill was $140. If this is indicative of the total population of users, and there is good indication that it is since the 35 non-node sites were not duplicated and appeared to represent independent locations, cost has become a lesser factor as experience with the Network provides evidence of its usefulness to users. The access node associations of the 19 sites were: Anchorage (8); Juneau (5); and Fairbanks (6).

Two related questions bore on the ability of the EMS to reduce the isolation that remote sites have historically felt in timely and pertinent communication with other organizations throughout the State. Both are analyzed as different aspects of the same broad question and are compared to responses received in the June, 1980, evaluation to determine changes in user perception relative to this important issue. The two questions were: (1) *Is the ability to communicate or receive communication more promptly through EMS an advantage in your day-to-day operation?* and (2) *Do you feel more in touch with other parts of the State now than before EMS?*

In response to (1), 19 node and 42 non-node users answered affirmatively and 1 node and 3 non-node users answered negatively. Thus, 96 percent of responders felt that the timely receipt of information was important to their daily operation.

In response to (2), 19 node and 40 non-node users answered affirmatively; 1 node and 4 non-node users answered negatively. Therefore, 92 percent of all users felt they were more in touch with the rest of the State than previously.

There is a very high correlation between the answers to these questions. This indicates a strong consistency which reinforces the conclusion that the more rural and isolated users believe this is an important aspect of the EMS from their perspective.

In the 1980 evaluation, users were asked the question about feeling more in touch with other parts of the State than before the EMS. At that time about 63 percent of both node and non-node users answered in the affirmative; more than 15 percent disagreed with the majority, and approximately 20 percent said it was too early to tell. The change in the eighteen months since then is quite dramatic.

Users were asked *how they felt the EMS fit in with their overall interdistrict/State Department communications*. The purpose of this question was to ascertain the percentage of business communications that users felt were best conducted over the Network in contrast to phone or mail.

The mean percentage of phone and mail traffic replaced by EMS for node city users was 19 percent (range from 1-40 percent); for non-node users, 18 percent (range from 1-60 percent). Only 4 of the 20 node city responders noted less than 10 percent displacement, while 6 of 30 non-node sites noted less than 10 percent displacement. The results indicate that, overall, approximately one-fifth of the inter-district and DOE communications is carried on best via EMS. This represents a small increase over the result of the June, 1980, evaluation in which the mean percentage of phone calls replaced by EMS for reporting school districts was 17 percent (range 0-65 percent) and the mail displacement was 14 percent (range 0-65 percent), for an average displacement of 15.5 percent.

When asked about *uses other than for the transmission and reception of straight-forward messages*, users located at nodal cities expressed little interest except for in-house purposes. In that instance, 9 of 20 (45 percent) indicated such in-house use. The most frequently mentioned uses were for lists associated with students and staff, a variety of word-processing systems, and commercial programs for data management. Three users expressed the desire to access information data bases directly from their sites. It is assumed this refers to the need, at present, to go through DOE or the State Library in order to reach such data bases as Lockheed and SDC. This desire for direct access is quite evident for consistent users of the Alaska Knowledge Base System.

Non-node site users were much more eclectic in their needs for information. In response to the listed items presented in the questionnaire, they responded as follows:

Information Requested	**Numbers**
Title I	6
Student Accounting	3
Staff and Facilities Accounting	2
SPAN (Systematic Planning Around Needs)-includes the Alaska Knowledge Base System	10
In-House	17

NOTE: Both the Student Accounting and the Staff and Facilities Accounting are in the In-House applications desired by the responders.

Of the 35 sites responding to this question, 17 stated that they were using the microcomputer for such in-house purposes. This represents approximately 50 percent of the non-node site population – a large increase over the year-and-one-half since June, 1980. The most frequent uses were student-related, financially related, games, and word processing.

Next to in-house uses, accessing the Alaska Knowledge Base System was the most frequent application mentioned as not – "message" – related. The Alaska Knowledge Base System is a data base in SPAN which stores data files, on a Juneau based computer, containing educational information specifically related to the Alaskan environment. The ETA Project was responsible for making the data files available to the field via EMS.

In the June, 1980, evaluation, some districts were already using the computer for non-EMS purposes; others were planning to do so. The non-EMS priority-ordered uses were listed as: bookkeeping/record keeping; Title I reporting; accounting; student accounting and vocational education (equally frequent); Alaska Knowledge Base system and personnel records (equally frequent); and filing systems. The priorities, using the information from this EMS User Survey (January, 1982) were: SPAN/Alaska Knowledge Base System; financially related information; student-related and Title I reporting (equally frequent); and others. The shift of the Alaska Knowledge Base System from almost last to first priority is indicative of the perceived value as the data files become more accessible and timely because of improved communications. Prior to the EMS, requested information was received on-site via the mail. It could take weeks to forward the request and additional weeks before the information/materials were received.

Users were asked to *prioritize additions/changes listed in the survey instrument*. Eighteen node sites and thirty-one non-node sites reported. Since there was no requirement to place priority numbers against every item listed, as few as ten comments were received on some items (node and non-node collectively) and it ranged up to 29 for the one receiving the most comment. By taking a weighted average for each item listed, some idea was gained as to the priorities as seen by the users at both nodal and non-node sites. These are listed in Table II-21.

Using this method, the top three priorities for both node and non-node users are the same but with a reversal between 1 and 2. Similarly, priorities 4 and 6 exhibit a reversal. It would appear, therefore, that users at node and non-node sites have similar requirements.

In the evaluation of 1980, intradistrict communications were also identified as a high priority improvement suggested by the Network users. It would appear appropriate to investigate means for interfacing the Apple II IST (Individualized Study by Telecommunications) microcomputer with the EMS. Thus, as the schools acquire these micros for

Table II - 21

PRIORITY CHANGES DESIRED FOR THE EMS

ITEMS	NODE PRIORITY	NON-NODE PRIORITY
The ability to send and receive mail in batch	5	5
Automatic receipt of messages	3	3
Capability to print out mail faster	6	4
Easier to operate	4	6
Intra-district communications capability	1	2
Easier access to the host computer	2	1
Other	–	–

student courses, they would represent a growing network of EMS users as well, but at marginal cost.

Other changes nodal site users requested included: faster on-line transmission and printing; ability to link up with other mail systems in the State; and ability for the Network to exercise stricter control over partisan materials transmitted over the system.

Changes suggested by non-node site users included: ways to cut down on long-distance charges; interface with the University of Alaska mail-drop system; ability not to receive specific messages and to delete them without having them print out; a means whereby a user can be notified that a message requiring immediate response is in the mailbox; standard software packages for accounting, etc.; incorporation of daisy-wheel (letter quality) printers; interface with the microfiche and inventory system; and printers which can handle larger-sized forms.

USER TRAINING AND SUPPORT

This portion of the questionnaire dealt with the adequacy of EMS operator training and support. This assumes great importance if the figures are indicative of the number of formally untrained operators in the Network. Responses from the node sites indicated that 14 operators had attended an EMS training session and that 10 had not. From non-node sites the response was similar; 25 had been trained and 15 had not. Of those operators who had received formal training, everyone stated that the training had been adequate. A similar question in prior years had elicited a 12 percent negative response from agency users.

Although no nodal site users recommended how the training could be improved, non-node site users indicated that periodic reviews were desirable, on-site training would be preferable to training operators at an off-site location, and additional training at the time of equipment installation would be very useful. In the June, 1980, evaluation, one of the most frequently suggested improvements was the desire for periodic retraining.

In light of the fact that 42 percent of operators responding from node sites and 38 percent from non-node sites had no training, the supporting materials assume major importance. In response to the question about adequacy of these materials, 18 responders from node sites and 35 from non-node sites felt the materials were adequate. Only two responders from non-node sites disagreed. It can be concluded, therefore, that the present version of the operators' training manual is excellent.

The desire for periodic refresher training was further reinforced by response to the direct question which elicited that a total of 30 responders wanted refresher training while 27 felt it was not necessary.

There was a good deal of unanimity of opinion between nodal city and non-node users about the *most useful functions provided by the Postmaster*. These were, in order of priority:

- information concerning the current status of user addresses; e.g., address updates, new users coming on to the Network, and periodic issuance of new directories;
- notices about System status including: notification of when the host will be down; notices of when host problems occurred so that there was no question about user micros; information about users being inoperative; checking on mail for districts that are temporarily down; and
- messages and new materials of interest relative to the Network.

When asked about *what other functions would be useful for the Postmaster to provide*, a familiar theme was struck in that the most requested function involved new software for the system. The vast majority, however, felt the Postmaster was doing an excellent job and that there were no pressing needs not being met.

In summary, the Network support was considered by all users to be excellent and very adequate.

MAINTENANCE

In this section of the questionnaire, an attempt was made to identify whether some chronic problems that had shown up previously still existed. From the initial installation, for example, telephone lines in rural communities had been a major source of trouble, as had certain elements of the on-site equipment.

When asked what *hardware/software items have caused problems,* both node and non-node sites singled out telephone lines as the major culprit. Of the 24 problem items checked by the 20 node sites, 9 were attributed to phone lines (38 percent), 3 each to printers and diskettes, and 2 each to the GNAT, modems, and data phones. Non-node sites had similar experiences in that 17 of 48 problems were attributed to telephone lines (37 perecent), 8 to modems, 6 to the GNAT, 5 to printers, 4 to diskettes, and 3 each to the Beehive and dataphone.

In previous evaluations, telephone lines in rural sites had always been a source of trouble. In this response, the percentage of reported problems by node cities is almost identical to that of the non-node locations. An in-depth analysis appears appropriate to determine if some of the problems encountered by the non-node sites were actually due to node site line troubles. A correlation, if found, could lead to corrections at the nodal sites (certainly more feasible than correcting all non-node sites) that could substantially improve overall Network performance.

In an attempt to identify whether one nodal site was more of a problem than the others, a correlation was run between non-node site trouble reports and the node city through which it accessed the host computer. It was found that the frequency of trouble reports was almost exactly in the same ratio of total non-node sites-to-access node in the instances of Anchorage, Juneau, and Fairbanks. Only one non-node site accessed Ketchikan.

$$\text{Ratio} = \frac{\text{non-node site trouble reports}}{\text{\# of non-node sites reporting to that access node}}$$

R (Anchorage) =7/13 = .54
R (Juneau) =5/13 = .38
R (Fairbanks) =3/6 = .50

It does not appear that any one access node is more of a problem than another. It may be that telephone circuits are a chronic problem throughout Alaska.

Busy signals were one of the most frequent troubles reported in the June, 1980, evaluation. Two problem-evaluation periods were analyzed at that time: Period 1 - October through December, 1979, and Period 2 - January through March, 1980. Of 14 trouble areas reported, the total number dropped from Period 1 to Period 2, but busy signals had increased substantially from 52 of 622 to 72 of 464. When users were asked if they *often received busy signals when dialing the host computer* in this EMS Survey, the results showed that 8 node sites of 20 (40 percent) and 14 non-node sites of 35 (40 percent) responded affirmatively. The problem of busy signals had not abated. Since the host could accept 64 simultaneous users, it is most likely not the computer that is causing this problem.

From the very outset of the ETA Project, management was concerned about maintenance. Because of the isolation experienced by many of the rural sites, especially in the winter, great pains were taken to be particularly responsive in this area. Even so, there were earlier instances when several weeks and even a month would pass from the time a problem was detected on-site to when the problem was corrected. Overall, however, this created little problem with users because breakdowns were infrequent. No formal survey had been taken, though, since the Administrative Communications Network was declared "operational."

Of the node sites that responded, 10 of 14 stated they did not have maintenance contracts. Three had contracts with Transalaska, the original installation contractor, and one had a contract with Lexitron. The statistics for non-node sites showed that 20 had no contract and 12 had contracts with Transalaska.

The question about whether maintenance was a problem was broken down into service, parts, and cost. Three node sites reported a total of four problems; two with service and two with parts. Four non-node sites said they had problems: four concerning service, three concerning parts, and two concerning cost. Of the three node sites, two had no service contracts and one had such a contract with Transalaska. Of the four non-node sites, two had no service contract and two had contracts with Transalaska.

In summary, the maintenance picture appears to be very good. The equipment continues to be very reliable as evidenced by the small number of problems and the fact that the majority of users do not feel it necessary to carry service contracts. Service appears to be quite adequate as shown by the small number of problems reported by the surveyed sites.

CONCLUDING REMARKS

This document was intentionally written as a history of the Administrative Communications Network. It represents a step-by-step account of the introduction of a technologically supported educational innovation on a large scale. The lessons contained herein have meaning to all educators interested in bringing about a change in traditional patterns. Indeed the lessons learned are of value not only in rural areas and in education, but anywhere and in any field that innovation is contemplated. All people are reluctant to change unless they can be shown that the change has associated with it rewards commensurate with the "sacrifices" of established norms with which they have grown comfortable.

Throughout this volume recommendations have been included and put in such a form as to show their value not only in the context in which they were born, but to the many readers who will look to this document for guidance in their own circumstances. It is because the sponsors of this Project, the National Institute of Education and the State of Alaska, wanted a living document, one that can be used by others to provide guideposts along the path to change, that this volume has taken on its present format. The recommendations follow the evaluations that created them. In this way, the reader can see what necessitated these changes and relate them to his/her own situation. If the situations are similar, the recommendations have a large measure of validity in their context; if the situations are radically different, the suspect recommendations shoud be avoided or modified to conform to the reader's needs. In any event, all recommendations act as "flags" identifying for the reader areas to be aware of, even if not directly applicable.

In his presentation, "Introduction of a Successful Educational Innovation – The Educational Telecommunications for Alaska Project (ETA)" at the Rutgers University Conference, "Telecommunications in the Year 2000" (November 19, 1981), Mr. Albert Feiner, former NIE Program Manager, summarized the Alaskan experience into 16 key points that are rules to follow when introducing change (Table II-22). All the "guidelines" are self-explanatory; however, some deserve to be stressed again.

- *Items 2 and 3:*

  It is essential that all involved realize that acceptance of innovation is a personal thing. Until the users internalize the value of the innovation, *in their own context*, it will not be utilized. This is not accomplished in the course of one year and may take more than five.

Table II - 22

GUIDELINES FOR A PROJECT DESIGNED TO INTRODUCE INNOVATION

- **Use the technology to enhance the solution of the problem rather than as an opportunity to apply a favored technology.**
- **All involved must make a long-term commitment.**
- **Funding mechanism must be established to at least create a "critical mass."**
- **Be flexible -- be able to adapt to the unanticipated.**
- **Institutionalization begins at the planning stage.**
- **An information dissemination plan must be developed at the very beginning.**
- **Pre-selling of the concepts to those who will be impacted is essential.**
- **The project should be designed as the "nucleus" of the eventual large-scale implementation.**
- **The "nucleus" should be composed of "Enthused Supporters" and represent a microcosm of the full-scale environment.**
- **Uncontrollable variables must be identified to the greatest extent possible.**
- **Evaluation must be built-in as an on-going management decision making tool.**
- **Users must have a meaningful and continuing role.**
- **Plan from the outset the gradual hand-over of responsibility and funding for the operational system.**
- **A training program is key to institutionalization.**
- **Allow users to innovate within their local environment.**
- **Beware of the existing technologies.**

- *Items 8 and 9:*

Over the past twenty years, *demonstrations of educational technology have*, in the main, *failed to foster institutional change*. A mechanism must be built in from the beginning to transition the innovation to user support should acceptance be noted and expectations raised. We have found that by building upon the original model, each new addition receives support from those already receiving satisfactory service.

- *Item 11:*

Short, but meaningful, evaluations must be designed from the outset to test critical stages of the innovation introduction. These can be as short as one or two months, but are essential in guiding management. *Do not be afraid to make radical changes if the situation demands it*.

- *Item 14:*

The interface of people with technology, especially those unaccustomed to that interface, is very important. They must be made comfortable in the presence of flashing lights and machines that "talk back." Further, all levels of users must be made to understand what is going on. In the introduction of the EMS, for example, although there were trained operators who actually used the on-site microcomputers, *superintendents and administrators were given talks and even took part in the operator training sessions*. There were no surprises for them.

- *Item 15*:

Internalization of the usefulness of the technology is essential to acceptance, as mentioned earlier. There is no better way to build strong grassroots support than to allow local personnel to use the technology as it best fills their needs. One of the greatest successes enjoyed by the ETA Project has been the innovative ways school administrators and staff have used the micros for their own local uses, e.g., for keeping student files and for financial record keeping. These users are among ETA's strongest supporters.

- *Item 16*:

The technologies introduced in the Project were in all instances well-studied and understood. Their strengths and weaknesses were known ahead of time. However, when these technologies must interface with existing, and in many cases, "primitive" ones, BEWARE! It can be unreliable and unregulated local power sources or noisy local telephone loops, etc. that destroy the effectiveness of the system concept. These must be accounted for *before* monies are spent to install the new technology.

APPENDIX A

ADMINISTRATIVE COMMUNICATIONS NETWORK KEY EVENTS

EXPECTED RESULT

"A model administrative network among and between DOE, school district offices, RRCs, and some local schools supported by telecommunications provides more efficient management by permitting timely input and greater communication and field participation." (See Figure II-1 which appears at the end of this Volume.)

KEY EVENTS

1.0.1.0. Exploratory Electronic Mail System (EMS) bid specification developed.

Verifiable Indicator 1.0.1.0.: Completion of bid specifications for EMS hardware and software approved by communications engineer and Project Director; approved by DOE by 1/2/78.

1.0.2.0. Preliminary EMS protocols developed.

Verifiable Indicator 1.0.2.0.: Preliminary protocols for EMS developed and documented; approved by Project Director and by DOE by 3/1/78.

1.0.3.0. Report on EMS Exploratory Test completed.

Verifiable Indicator 1.0.3.0.: Report on EMS Exploratory Test, involving utilization of the EMS at at least ten sites, approved by Project Director; approved by DOE; submitted to NIE by 10/1/78.

1.0.4.0. ETA computer installed.

Verifiable Indicator 1.0.4.0.: Certification by systems analyst that ETA computer is installed in and operated by State Department of Data Processing; approved by Project Director by 10/1/78.

1.0.5.0. EMS revised.

Verifiable Indicator 1.0.5.0.: Documentation completed on revision of EMS, based on Exploratory Test and changed hardware; approved by systems analyst, communications engineer, and Project Director by 8/31/78.

1.0.6.0. Final EMS protocols developed.

Verifiable Indicator 1.0.6.0.: Documentation completed on final EMS protocols; approved by communications engineer and Project Director; approved by DOE by 9/29/78.

1.0.7.0. EMS user-training system developed.

Verifiable Indicator 1.0.7.0.: Complete documentation of EMS user-training system including user handbooks approved by communications engineer and Project Director; approved by DOE by 9/29/78. (Submit "User Handbook")

1.0.16.0. "Backbone" communications network installed.

Verifiable Indicator 1.0.16.0.: Multiplexers installed in Fairbanks, Anchorage, Juneau, and Ketchikan; certified as operational by communications engineer by 10/5/78.

1.0.8.0. EMS terminals installed.

Verifiable Indicator 1.0.8.0.: Certification by communications engineer that all EMS terminals are installed at sites and that at least 50 are operational; approved by Project Director by 10/15/78.

1.0.9.0. EMS user training completed.

Verifiable Indicator 1.0.9.0.: Certification by communications engineer that EMS users at all sites are trained according to the specifications in the user-training system; approved by Project Director by 10/15/78.

1.0.10.0. Electronic Information System (EIS) protocols developed. *(NOT IMPLEMENTED)*

Verifiable Indicator 1.0.10.0.: Documentation completed on EIS protocols; approved by communications engineer, systems analyst, and Project Director; approved by DOE by 8/31/78. (Submit "EIS Protocols")

1.0.11.0. EIS documentation applications developed. (*NOT IMPLEMENTED*)

Verifiable Indicator 1.0.11.0.: Report of one DOE EIS application developed, documented, and operating at a demonstration level; approved by communications engineer, systems analyst, and Project Director; approved by DOE by 1/31/79. (Submit "Result of Demonstration")

1.0.12.0. Report of EMS and EIS completed.

Verifiable Indicator 1.0.12.0.: Report on implementation and utilization of EMS and EIS; approved by communications engineer and Project Director; approved by DOE by 6/30/79. (Submit "Report")

1.0.13.0. Additional EIS implemented. *(NOT IMPLEMENTED)*

Verifiable Indicator 1.0.13.0.: Additional EIS requested by DOE implemented and operating; approved by communications engineer and Project Director by 6/30/80.

1.0.14.0. Policy recommendations for EMS and EIS completed.

Verifiable Indicator 1.0.14.0.: Policy recommendations regarding institutionalization of EMS and EIS completed; approved by communications engineer and Project Director; approved by DOE and submitted to NIE by 6/30/81.

1.0.15.0. EMS and EIS institutionalization.

Verifiable Indicator 1.0.15.0.: EMS and EIS completely operated by Alaska school districts, RRCs, and State agencies by 5/31/82. (Submit "Evaluation Report")

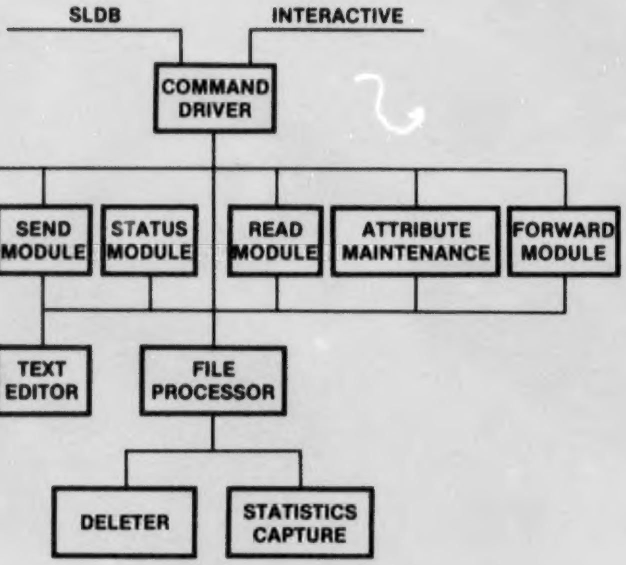
APPENDIX B

DESCRIPTION OF THE EMS SOFTWARE

Figure B-1 schematically depicts the operation provided by the EMS software. The System can accept either SLDB or real-time interactive input.

Figure B · 1

MAIL SYSTEM FLOW


SLDB
INTERACTIVE
COMMAND DRIVER
AID MODULE
SEND MODULE
STATUS MODULE
READ MODULE
ATTRIBUTE MAINTENANCE
FORWARD MODULE
TEXT EDITOR
FILE PROCESSOR
DELETER
STATISTICS CAPTURE

1. *COMMAND DRIVER*

The purpose of the Command Driver Module is three-fold:

- proper qualification of the user for entrance into a particular mailbox;
- routing of the tasks performed by the EMS to appropriate modules within the System;
- termination of operations by ensuring that files have been closed, statistics placed on the statistical journal, and escape from the EMS is completed for proper file integrity at session wrap-up.

2. *SEND MODULE*

The Send Module contains the logic which provides the user with the means to compose and edit messages. Once entered into this Module, the user remains there until entering the EXIT command. Entry to the Text Editor is blocked in a batch mode as the Text Editor requires highly interactive inspection of its activities.

3. *READ MODULE*

This function allows the user to read the contents of the mailbox entirely and selectively, both interactively and in batch.

4. *STATUS MODULE*

The purpose of the Status Module is to provide the user with an indexing feature that has three functions:

- entirely or selectively view the Table of Contents of a mailbox;
- clear or delete all or selected messages from a mailbox;
- acknowledge receipt of mail and view acknowledgements from others.

In addition, the Status Module provides the File Processor with the statistical activity of the Electronic Mail System.

5. *ATTRIBUTE MAINTENANCE*

The EMS provides the feature of group addressing through use of System and user-defined attributes. The Attribute Maintenance module provides the facility for creating, changing, and deleting such attributes at two levels:

- Postmaster can update only System level attributes; and
- user can update only attributes associated with a discrete mailbox.

This feature allows mass broadcast of a message; the validity of the list of names is critical. Therefore, Attribute Maintenance has been made an interactive operation.

6. *FORWARD MODULE*

From time to time it will be necessary for a user to supply copies of a message to others who have interest in its contents, but who were not included in the address lists supplied by the original sender. The Forward command structure will allow one and only one message to be forwarded to one or multiple mailboxes at a time. Status information of forwarded messages will contain information identical to that received by the original recipient, except that the sender's name will be the forwarder's name; also an indicator will be set to identify the message as being sent by the Forward function. The text and heading of the actual message will remain entirely intact with no change of sender data.

7. *AID MODULE*

The purpose of the Aid Module is to provide the user with summary-level documentation concerning the operation of the Mail System. This Module will read and display a text file. The text file will be created and maintained by the Postmaster.

8. *FILE PROCESSOR*

The purpose of the Mail File Processor is to manage the data received from, used by, and sent to users of the EMS. The discrete types of data that are maintained include the following:

- *Directory*

  Since there may be multiple mailboxes per Project programmer number, it is necessary for the user to identify the logical mailbox to be accessed. This is accomplished by having the mailbox identified, first, by name and, further, by password. The Directory contains all valid mailbox names, passwords, network location, Project programmer number, location for mail storage, date and time of last mailbox access, and an indicator that identifies status of mailbox.

- *Status*

  The purpose of providing the user with status data is to present, concisely and upon request, not only the user's mailbox contents but also any acknowledgements received from other mailboxes of letters sent by the user. Elements used in the Status records will contain message number, sender name, date and time sent, abbreviated subject, an indicator that identifies the message as "old" (already read) or "new" (not yet read), forwarded, an indicator that identifies that this entry is an acknowledgement only, and the number of lines in the message.

- *Messages*

  The repository for each entire message including heading information is the Message file. The file contains all elements of the record posted in the recipient's Status file as well as the full subject line, full attention line, and complete copies-forwarded list.

- *Attributes*

  The purpose of Attributes is to provide the user with a shorthand method of addressing a group of message recipients without a requirement to actually input each and every name in the list. Attributes are assigned at two levels: System-wide and user-created. Each Attribute record contains the Attribute identifier and the mailbox names associated with it. This facilitates maintenance of the list of names by the Postmaster (at System level) and the user (at the user level) to specific addresses on the System. The only exception to the Attribute concept is the Attribute which generates messages to ALL mailboxes on the System.

- *Linkages*

  The File Processor will interact with other Electronic Mail System modules in order to process the mail data files appropriately.

9. DELETER

The purpose of the Deleter module is to maintain the message data files through interrogation of the Status files and System Directory in the function of removing messages from the disk which have resided in a mailbox for at least seven days. The module purges these messages based on date and time and is triggered to run by the Mail File Processor at a non-prime time of the day.

This module produces a report to the Postmaster of the Status records used to purge mailboxes. Exceptions to the seven-day rule are:

- Mailboxes in the vacation status are allowed to reach the FULL status with purging taking place a day's message at a time after the FULL condition is reached.
- Inactive mailboxes are always purged of all mail (if any exists) regardless of time.

10. *STATISTICS CAPTURE*

Statistical data are collected in the form of a chronological journal continually throughout the day. The daily statistical reports are produced *ad hoc* after the statistical file has been dumped to tape. This daily file dump occurs after the System deletion has run since it too provides statistical data to the journal file. The records are posted in the following categories:

- *Status Records* - when they are posted to a user's mailbox;
- *Session Records* - consisting of name, log-in codes of the mailbox, start and stop date, and time of mail execution;
- *Deletion Records* - date and time, plus the Status Record image whenever a user or the Deleter Module removes an entry (including acknowledgements) from the mailbox.

This file is purged after it has been successfully captured on tape each day and established with zero blocks for the next day's collection of data.

11. *TEXT EDITOR*

The purpose of the Edit module is to provide the interactive EMS user with the facility to view and correct message text and heading information. The module is intended for interactive use since parallel editing is provided in the intelligent off-line remote storage device. Also, since editing is time-consuming and requires a mode of operation which is highly prone to error, this module is considered as a fall-back to off-line text editing. In other words, its only use should be when the off-line storage medium is out of service.

Detailed specifications containing all commands and steps required to perform all EMS functions are contained in the "Electronic Mail System (EMS) Specifications," Alaska Department of Education and Northwest Regional Educational Laboratory, July 11, 1978.

APPENDIX C

ELECTRONIC MAIL SYSTEM CONDITIONS FOR USE

AGENCY: ______________________________

____

1. The agency will be assigned a mailbox in the Electronic Mail System and is permitted to send and receive messages and respond to requests for information and assistance from System users for purposes such as those listed on the agency's letter.

2. Leased line and central data processing costs associated with the Electronic Mail System will be paid by the Department during FY-80.

3. The Mail System has been designed for the efficient transmission of short messages using the remote detached batch method of message entry. Whenever possible, the agency shall use the remote detached batch method of message sending. Further, messages shall be limited to one-half page of text whenever possible. In no case shall lengthy documents be transmitted over the System.

4. It is recognized that most users of the Electronic Mail System pay long-distance charges to reach remote entry ports located in Fairbanks, Anchorage, Juneau, and Ketchikan. Care shall be taken when initiating messages to these users to keep the messages as brief as possible and screen out non-essential or unnecessary messages. Further, it is realized that any Electronic Mail System user has the right to refuse to receive messages at his/her option.

5. This Agreement shall be subject to review and renegotiation in FY-80.

MEMORANDUM OF AGREEMENT

This is an Agreement between the Department of Education and ________

____

for use of the Department's Electronic Mail System.

The above named applicant is hereby granted permission to use the Electronic Mail System in accordance with the attached EMS policies and conditions.

____
Department of Education

____
Applicant Agency

____
Date

____
Date

EMS POLICIES

Policy 1.0: User Admittance

1.1 The Electronic Mail System, comprehensive data network, and all related or resultant data files and general systems are to be designed for usage by the Department of Education, Regional Resource Centers, and the fifty-two school districts. These agencies have priority use of the System.

1.2 Other educational agencies can be granted use of the Electronic Mail System by ETA Project management. Agencies selected in this manner shall only be added where there is clear evidence of potential benefits to the priority users, where the proposed utilization is consistent with established ETA policies, and the System is not degraded for the priority group.

1.2.1 Requests for admittance by other agencies shall be through formal application. Said applicant shall provide information as requested by the Department and shall agree to abide by any and all conditions established by the Department.

Policy 2.0: Systems Security

2.0 Department of Education/ETA Project staff shall develop specific guidelines, in conjunction with EMS users, for the purpose of ensuring systems security and the protection of data files from unauthorized access.

Policy 3.0: Data Acquisition and Research

3.1 The Department of Education and its contractors may acquire data consistent with the need to evaluate benefits and effectiveness of any and all portions of the communications or data system. However, no data acquisition activity may include accessing the content of individual user mailboxes.

3.2 Other than those Federal and State educational reports required by law or regulation, no user may conduct a formal research or survey activity over the Electronic Mail System without prior approval of the ETA Project management. This prohibition is not meant to include casual queries which would be found in ordinary business correspondence.

Policy 4.0: Use of Terminal Devices

4.1 Any participant may use the terminal device for data processing and communications to parties external to the Project. However, such a relationship shall not interfere with routine Mail System use nor allow access to other Project participants through the System.

Policy 5.0: Chargeback System

5.1 During FY-79 and FY-80 the ETA Project shall pay necessary charges for the leased line network and the host computer for the Electronic Mail System. Commencing in FY-81 a chargeback scheme for leased line and computing costs shall be initiated. At that time EMS users will be expected to pay a pro-rated share of these costs to participate on the network.

APPENDIX D

STATEMENT OF UNDERSTANDING
BETWEEN

AND
EDUCATIONAL TELECOMMUNICATIONS PROJECT
DEPARTMENT OF EDUCATION

The Educational Telecommunications Project (ETA), through the State Department of Administration, Division of Data Processing, is providing data terminal equipment to your district to be utilized for educational telecommunications purposes. The equipment and supporting kits and supplies are described in Attachment A to this document (not provided). This equipment was procured by the ETA Project through a 24-month lease/purchase agreement with the understanding that local school districts have the option to purchase the equipment at the end of the 24-month period for a nominal transfer of title fee.

Conditions of the lease/purchase agreement with the vendor, Transalaska Data Systems, include the following:

1. Unrestricted Use and Function

The State may use the equipment purchased or lease/purchased hereunder for any purpose whatsoever without restriction.

Unrestricted Location

The State may relocate the equipment anywhere in the United States without restriction, at any time and from time to time provided such relocation is carried out with due care under the supervision of qualified maintenance personnel. Any damage to the equipment as a result of such relocation shall be promptly repaired by the State, at State's expense, unless a relocation agreement is in effect. In this event, maintenance will be negotiated.

2. The Contractor represents that, in any case where expansion equipment can be installed or obtained through field modification of any component contracted for herein, the Contractor shall make such installation when requested by State at charges then in effect.

3. Acceptable Supply Vendors

The suppliers who are specified in the Contractor's response are acceptable to Contractor as suppliers of supplies utilized for the System and Contractor acknowledges that such supplies as presently marketed by those suppliers meet the specifications outlined herein.

The State reserves the right to obtain similar supplies from nonlisted suppliers provided that they meet specifications as indicated and are acceptable to the Contractor. Acceptance will not be unreasonably withheld and will be based solely upon the specification.

4. Guarantee of Availability

The Contractor agrees to make the supplies listed in his bid response available in sufficient quantities to meet the user's requirements for as long as the equipment contracted for hereunder is utilized by the user. Such supplies shall be made available from time to time at prices then in effect.

5. Interface with Other Equipment

The State shall have the right to connect the equipment herein contracted for to any equipment manufactured or supplied by others including, but not limited to, peripheral equipment, other computers, communications equipment, terminal devices, and the like. The State shall notify the Contractor at least ten days prior to any such connection and, if the Contractor shall deem it necessary or desirable for proper maintenance of the equipment, the Contractor shall make or supervise the interconnection, at Contractor's expense, and supply any interface devices requested as described in published Contractor manuals at published prices.

6. Changes and Attachments

The State shall have the right to make changes and attachments to the equipment, provided such changes or attachments do not lessen the value of the equipment, prevent proper maintenance from being performed, or unreasonably increase Contractor's cost of performing maintenance. The State shall give the Contractor ten calendar days' notice before making such changes or attachments.

7. Right to Replace Components

The Contractor shall, upon request, immediately replace any component whose operating characteristics exceed the "downtime percentages" in Schedule A by 10 percent in any 90 days, 20 percent in any 60 days, and 40 percent in any 30 days.

8. Reliability Parameter Defined

$$\text{Downtime \%} = \frac{\text{Unavailable Time - Scheduled Maintenance}}{\text{Total Time}}$$

STATED MONTHLY

Unavailable Time = system fails to operate;
system fails to operate because of environmental power requirements in process of being maintained or repaired;
hardware/software problem bringing down system;
not operated because of potential dangerous defect in software.

9. Backup Availability

In the event any leased equipment is unavailable for use because of maintenance or repair for a period of more than ten days, or in the event that it is reasonably anticipated that maintenance will exceed ten days, the Contractor will make available for the user spare equipment without additional charge.

10. Site Preparation Responsibility

The State (local district) shall, at its own expense, prepare the site in accordance with the installation specifications set forth in Schedule A, not later than fifteen days prior to the scheduled delivery date of the equipment, and the site shall thereafter be available for inspection and approval.

During installation the Contractor shall inspect the site; Contractor shall set forth in detail each deficiency within thirty days after receipt of Contractor's notice; and if user shall fail to correct such deficiencies within the permitted time, Contractor shall have the right to do so, at user's expense.

State shall provide the following (local district responsibility):

a. State will supply connection to local telephone company and associated phone lines and hand set (07B programmable).

b. State will supply one outlet of 110 volts with a maximum of 1KVA rating.

c. State will provide table/desk of adequate strength to support equipment (approximately 3' x 5').

11. Installation Responsibility

The Contractor shall be responsible for unpacking, uncrating, and installing the equipment, including the installation of all necessary cabling, connection with power, utility and communications services, and, in all other respects, for making the equipment ready for operational use. Upon completion, the Contractor shall notify the State that the equipment is ready for use.

I understand use of the ETA data terminal equipment is subject to the above conditions of contract between the State and Transalaska Data Systems, Inc. and agree to abide by said conditions.

____

Authorized Representative

____

School District

APPENDIX E

STATE OF ALASKA

DEPARTMENT OF EDUCATION

JAY S. HAMMOND
GOVERNOR

OFFICE OF THE COMMISSIONER

POUCH F-ALASKA OFFICE BUILDING
JUNEAU 99811

April 21, 1980

MEMORANDUM OF UNDERSTANDING

It is understood that the Educational Telecommunications for Alaska (ETA) project will receive data processing support from the Division of Data Processing, while the Division of Communications is to be responsible for providing the communications capability required to connect users of the data processing system and their terminal devices with the central computing system.

The Reimbursable Services Agreement (RSA) negotiated between the Department of Administration and the Department of Education describes the level of support and the types of data processing services which the Division of Data Processing will provide. In terms of equipment, the RSA indicates that the Division of Data Processing will provide the computer resource including operation and maintenance, and input/output and storage devices, and the computer terminals and their associated modems. Through a separate RSA the Division of Communications will provide the multiplexing equipment, rotary switches, and other devices necessary to attach the computer to the telephone lines and, therefore, to the terminal equipment. The Division of Communications will also be responsible for the management of the communications lines, whether they be owned by the state or provided by a common carrier.

Because of the requirement to interconnect the data processing equipment and the communications equipment, it is anticipated that the development of standards and the selection of specific equipment will be a shared responsibility. It is especially important that there be a coordinated effort for the selection of all communications equipment and terminals. It is understood that the responsibility for the success of the project is shared between the Division of Data Processing and the Department of Education and that the model for joint decision making described in Attachment B will be in effect. The maintenance contract for the terminals and their modems will be negotiated by the Division of Data Processing and included in the lease/purchase contract. Should it be appropriate to do so and with agreement by the Department of Education, payments for terminal maintenance may be assigned to other governmental agencies. The Division of Data Processing will work with the Department of Education to determine the requirements for terminal equipment and to aid in the acquisition and delivery of terminals to the user sites. Further details of this agreement are specified on Attachment A: Procedures, Attachment B: Policies, and Attachment C: Budget.

April 21, 1980
Memorandum of Understanding

Attachment A

PROCEDURES

Purpose: To operate and maintain a data processing facility capable of providing the level of service defined by this agreement to the Educational Telecommunications for Alaska Project. (ETA)

The ETA project includes the installation and operation of computer hardware and terminals to support the ETA "Administrative Communications Network," an information retrieval system, and instructional program development. These items are described in the ETA "Operational Plan," dated December 1978 and subsequent documents.

Billing Procedures and Scope of Work: Division of Data Processing services during the period of July 1, 1979, through June 30, 1980, will be provided on a monthly reimbursable basis in an amount not to exceed $552,492. For this amount, the Division of Data Processing will provide support at the level of a PDP 11/70, plus maintenance, operations, system software support, floor space, all utilities and supplies required to operate the computer facilities, and terminal and initial terminal supplies for up to 60 sites. Maintenance of the terminals is to be provided. Additional terminals shall be available for purchase under a contract award.

In addition the Division of Data Processing shall provide applications software maintenance for the Statewide Administrative Network, the SPAN information base, the ETA MIS program, the DOE Federal Programs Accounting package, and IST student record keeping programs. As time permits, assistance will be provided to the department in designing additional software packages or adapting existing packages for the PDP 11/70.

The Division of Data Processing will negotiate the maintenance contracts for the computer and terminals with the appropriate vendors. In future years, expenses will be recovered through additional RSAs and, ultimately, through a chargeback system based upon actual expenses in operating and maintaining the PDP 11/70 computer system and the associated networking hardware and software. The Division of Data Processing will assist the Department of Education in designing a chargeback system for this dedicated computer system to commence in FY1981.

The FY80 RSA budget on Attachment C is based upon current estimates. The billing will reflect costs to the maximum amount specified in the RSA. Title to the respective terminals will pass, respectively, to the school districts, regional resource centers, and the Department of Education according to the terms of the RSA and the terminal contract. These agencies will then assume responsibility for the maintenance of the terminals. Should funds for the project terminate, these agencies shall be given first option on exercising the terms of the contract.

Attachment B

POLICIES

a. The general scope of the work and cost level for ETA data processing activities shall be specified in Reimbursable Service Agreements for each fiscal year of operation.

b. DP shall appoint a single staff member to be responsible for interface with the ETA project.

c. It is recognized that the Division of Data Processing has the responsibility for the operation and management of the computer system and usual systems software support for the implementation of ETA data processing systems.

d. Monthly meetings shall occur which include, as a minimum, the DP appointee and the ETA project director for planning, progress review, and decision making. Resulting decisions shall be documented.

e. To facilitate the coordination of Data Processing activities and other ETA activities, schedules for Data Processing events shall be established in writing. Once these schedules are established, Data Processing shall use its best efforts to conform to the schedule. It is recognized that failure to meet such schedules will create down-time for other project efforts, increase costs, and reduce the chances for overall project success.

f. Procedures for equipment maintenance, operations, and system standards of the ETA PDP 11/70 computer shall be obtained or established in writing.

g. It is recognized that the ETA PDP 11/70 computer is dedicated to the DOE and that applications for the computer and users shall be approved, in writing, by the ETA project director. Developmental uses of the computer by the Division of Data Processing are allowable provided that these uses do not interfere with ETA applications.

h. Periodic meetings shall occur which involve representatives of the Department of Education, the Division of Data Processing, the Division of Communications, and representatives of other appropriate agencies to review ETA systems from a general perspective and to suggest modifications or revisions to improve ETA services.

i. Requests for service from Data Processing over and above normal operations and maintenance functions shall be transmitted from the ETA project director.

j. It is recognized that the NWREL has some responsibility for applications software maintenance for several ETA systems and shall be granted a greater level of access to the programs on the 11/70 than other users. Requests from the NWREL for access to the system over and above a reasonable level of software access shall be approved, in writing, by the ETA project director. Transmittal of such requests shall be on standard Request for Consultation Service forms.

k. It is agreed that, since the ETA PDP 11/70 computer has been paid for and its operation funded by the project, any chargeback system for ETA users shall recognize that fact.

l. Any modifications to the ETA computer and/or peripheral equipment shall be subject to the approval of the Division of Data Processing.

m. The applications programmer included in this agreement shall maintain and/or modify current ETA software and, with the approval of the ETA project director develop, maintain, or modify other Department of Education software if feasible. The applications programmer is to be devoted full time to the Department of Education unless this agreement is modified.

APPENDIX F

E.M.S.USER SURVEY

DIRECTIONS FOR RESPONDENTS (E.M.S. Managers)

Your assistance would be helpful in gathering information relevant to providing better service and to guide further growth direction of E.M.S. services. Please fill in those answers that are appropriate. When you are finished, please return your response to:

Annette G.E. Dalrymple
State of Alaska/Department of Education
E.M.S. Postmaster
Pouch F
Juneau, Alaska 99811
(907) 465-2875

Or you may send your response via E.M.S. at:

POSTMASTER
ANNETTE G.E. DALRYMPLE

Your response is requested by January 29, 1982. Thank you very much for your cooperation. If you have any questions, please feel free to contact me by telephone or E.M.S.

NOTE: This is a voluntary survey. Your assistance is requested, not required.

A. USER

1. NAME ______________________________

2. LOCATION ______________________________

3. POSITION ______________________________

4. ORGANIZATION ______________________________
   Address ______________________________
   ____
   ____

B. YOUR USES OF THE ELECTRONIC MAIL SYSTEM

1. HOW LONG HAS E.M.S. BEEN USED IN YOUR ORGANIZATION?
   ____

2. IS THE ABILITY TO COMMUNICATE OR RECEIVE COMMUNICATION MORE PROMPTLY THROUGH E.M.S. AN ADVANTAGE IN YOUR DAY-TO-DAY OPERATION?
   __________Yes __________No

2A. If NO, please explain: ______________________________
____
____
____

3. DO YOU DIAL LONG DISTANCE TO USE THE E.M.S.? ____Yes ____No

3A. If YES, where do you dial into?
_____Anchorage
_____Fairbanks
_____Juneau
_____Ketchikan

3B. If YES, approximately what does it cost you per month to dial into the E.M.S.?
_____$0.01 to $9.99
_____$10.00 to $19.99
_____$20.00 to $29.99
_____$30.00 to $39.99
_____$40.00 to $49.99
_____$50.00 or more (Approximate amount)_________

4. DO YOU FEEL MORE IN TOUCH WITH OTHER PARTS OF THE STATE NOW THAN BEFORE THE E.M.S.? _____Yes _____No

5. HOW DOES E.M.S. FIT IN WITH YOUR OVERALL INTER DISTRICT/STATE DEPARTMENT COMMUNICATIONS SYSTEMS?
_____%E.M.S.
_____%Phone Calls (Long Distance)
_____%Postal Service
_____%Other

6. DO YOU USE YOUR E.M.S. EQUIPMENT FOR PURPOSES OTHER THAN TO SEND OR RECEIVE MESSAGES? _____Yes _____No

6A. If YES, please check below:
_____Title I
_____Student Accounting
_____Staff and Facilities Accounting
_____SPAN
_____SOURCE
_____In House (Specify) ______________________
____
____
____

7. WHAT HARDWARE/SOFTWARE ITEMS HAVE CAUSED YOU PROBLEMS WITH E.M.S.? (Please list the number of problems you have had with each item.)

______Beehive
______Gnat
______Printer
______Diskettes
______System Programs
______Modem
______Telephone Lines
______Nodes
______Dataphone
______Other (Specify) ______________________________
____
____
____
____
____
____

7A. Please describe any continuing problems you are having or have had with E.M.S.?

____
____
____
____
____
____
____

8. WHAT CHANGES WOULD YOU LIKE TO SEE INCORPORATED TO MAKE E.M.S. EVEN MORE USEFUL TO YOU? (Please list in order of preference, using 1 as the most preferred.)

______The ability to send and receive mail in batch.
______Automatic receipting of messages.
______Capabilities to print out your mail faster.
______Easier to operate.
______Intra-district communications capabilities.
______Easier access to the host computer.
______Other (Specify)______________________________
____
____
____

9. WHAT OTHER TELECOMMUNICATION PACKAGES ARE YOU LOOKING AT TO EITHER REPLACE OR COMPLEMENT THE E.M.S.?

____
____
____
____
____
____

C. USER SUPPORT

1. HAS YOUR CURRENT OPERATOR ATTENDED AN E.M.S. TRAINING SESSION? ______Yes ______No

   1A. If YES, was the E.M.S. training adequate? ______Yes ______No

1B. If 1A is NO, then please explain how the training can be improved? ____

____

____

____

____

____

____

____

____

____

   1C. How often have you had to train a new operator since E.M.S. has been in your organization? ________________________Operators.

2. ARE THE SUPPORTING MATERIALS (Manuals, printouts, etc.) RECEIVED ADEQUATE? ______Yes ______No

   2A If NO, then please describe what materials you would like to see added.____

____

____

____

____

____

3. DO YOU THINK PERIODIC REFRESHER TRAINING IS REQUIRED? ______Yes ______No

4. WHAT ARE THE MOST USEFUL FUNCTIONS THE POSTMASTER PROVIDES TO YOU? ____

____

____

____

____

____

____

5. WHAT OTHER FUNCTIONS SHOULD THE POSTMASTER PROVIDE?__________

____

____

____

____
____
____

D. MAINTENANCE

1. DO YOU OFTEN GET A BUSY SIGNAL WHEN YOU TRY TO DIAL UP THE COMPUTER? ______Yes ______No

2. HOW OFTEN HAVE YOU HAD EACH PIECE OF YOUR EQUIPMENT WORKED ON IN THE PAST 12 MONTHS?

______Beehive
______Gnat
______Printer
______Modem
______Dataphone
______Topaz
______Diskettes
______Other
(Specify) ______________________________
____
____
____

3. DO YOU HAVE A MAINTENANCE CONTRACT?

______ No
______ Transalaska
______ Other (Specify)
____
____

4. HAS MAINTENANCE BEEN A PROBLEM FOR YOU?

Service	_____ Yes	_____ No
Parts	_____ Yes	_____ No
Cost	_____ Yes	_____ No

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ABBREVIATIONS

PREFACE

ACS	Alaska Communications System
AEBC	Alaska Educational Broadcasting Commission
AETC	Alaska Educational Telecommunications Consortium
Alascom	RCA Alaska Communications
APBC	Alaska Public Broadcasting Commission
ASOSS	Alaska State-Operated School System
ATS	Advanced Technology Satellite
AVEC	Alaska Village Electric Co-op
BIA	Bureau of Indian Affairs
DHEW	Department of Health, Education and Welfare
DOE	Alaska Department of Education
ERIC	Educational Resources Information Center
ESCD	Education Satellite Communication Demonstration
ETA	Educational Telecommunications for Alaska Project
NASA	National Aeronautics and Space Administration
NEA	National Education Association
NIE	National Institute of Education
OT	Office of Telecommunications in the Governor's Office
RCA	Radio Corporation of America
REAA	Regional Educational Attendance Area
RRC	Regional Resource Center
SPAN	Systematic Planning Around Needs
UNESCO	United Nations Educational, Scientific, and Cultural Organization
WACS	White Alice Communication System

ADMINISTRATIVE COMMUNICATIONS NETWORK

BPS	Bits per Second
CRT	Cathode Ray Tube (terminal display screen)
DA	Department of Administration
D & I	Design and Implementation Contractor

EMS	Electronic Mail System
ID	Identification Number
MLF	Division of Management, Law and Finance
NWREL	Northwest Regional Educational Laboratory
PTZ	Pacific Time Zone
SCRRC	South Central Regional Resource Center
SD	Standard Deviation
SERRC	South East Regional Resource Center
SHF	Super High Frequency
SLDB	Shared Link Detached Batch
TADS	Transalaska Data Systems, Inc.
TTY	Teletype
VHF	Very High Frequency
WRRC	Western Regional Resource Center

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